JULY 1954

WIRE AND WIRE PRODUCTS

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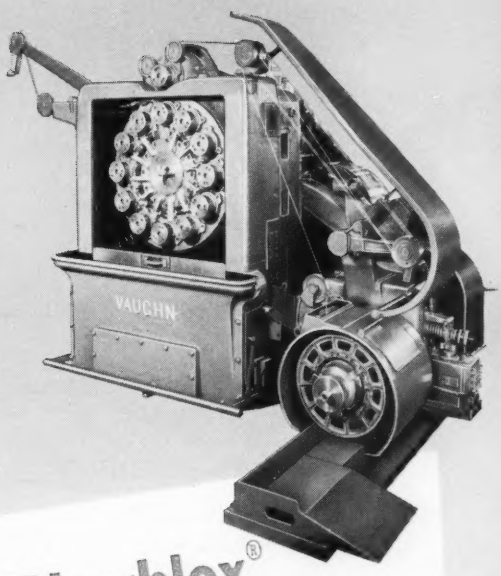
BUILDING A COMPLETE LINE OF

Tandem Machines

FOR DRAWING NON-FERROUS WIRE
(ALUMINUM, COPPER, ALLOY)



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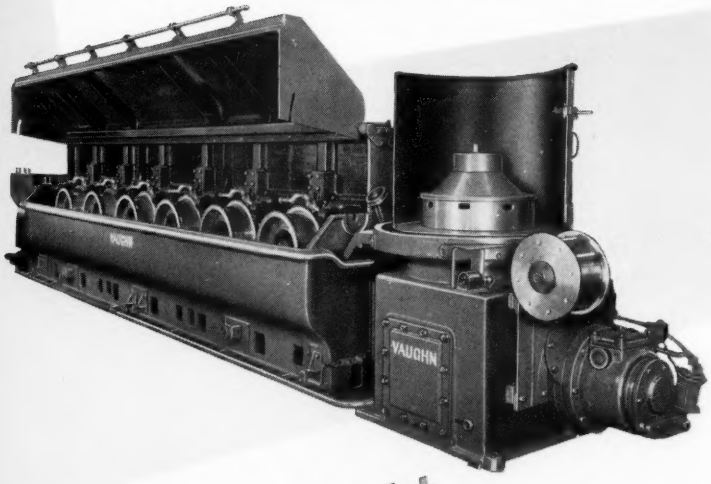
(Circular Tandem)
FOR INTERMEDIATE
AND FINE WIRE



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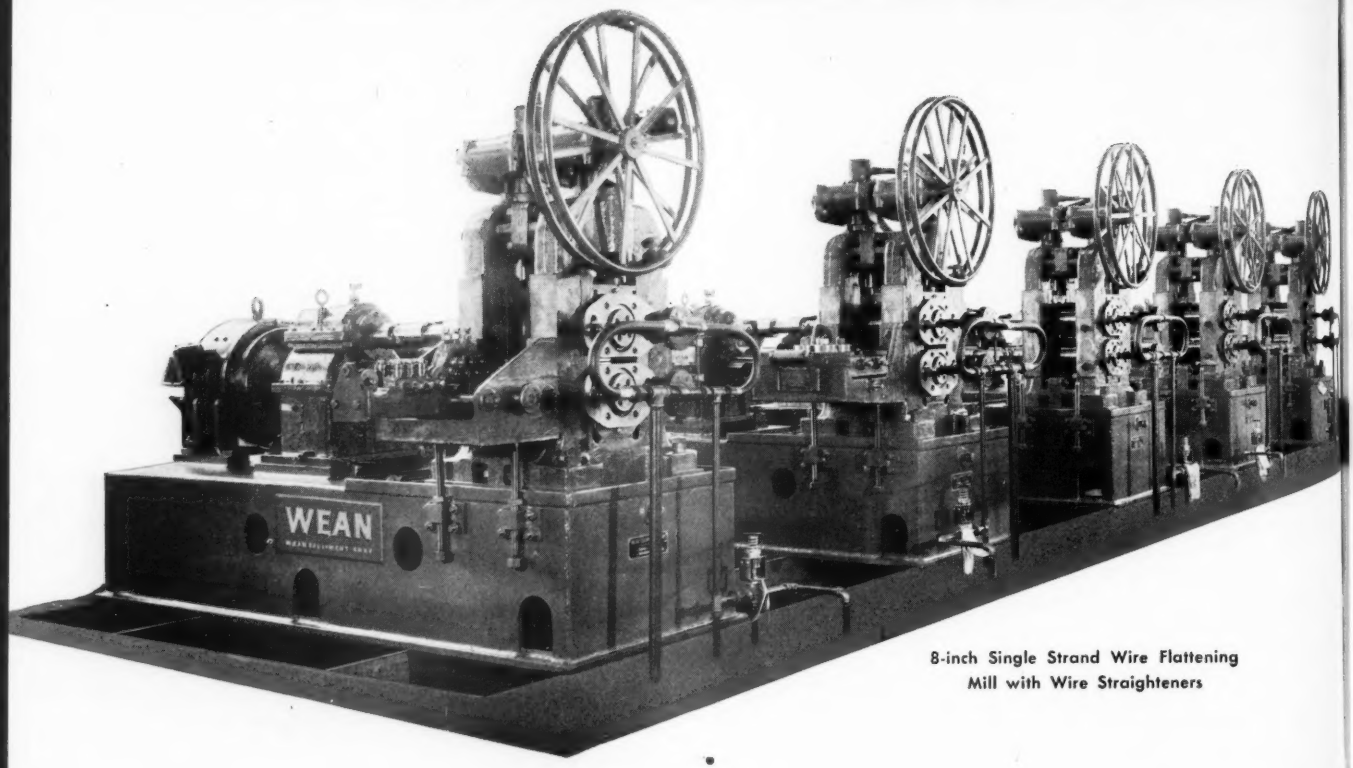

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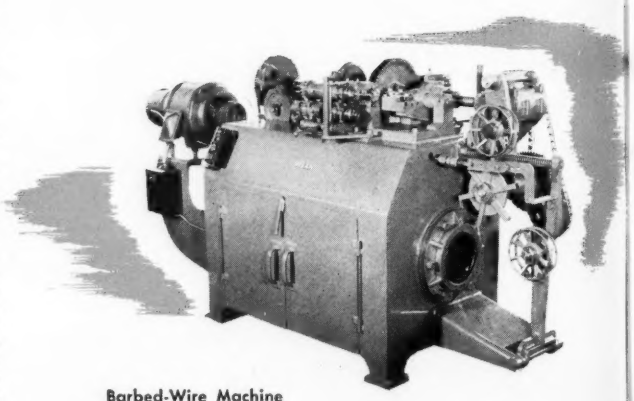
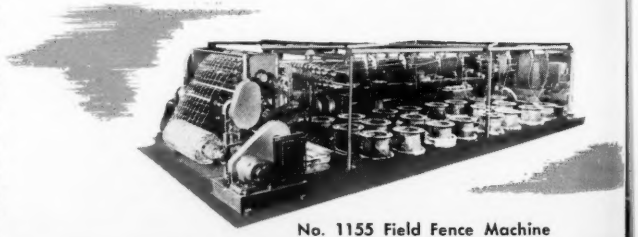


Barbed-Wire Machine



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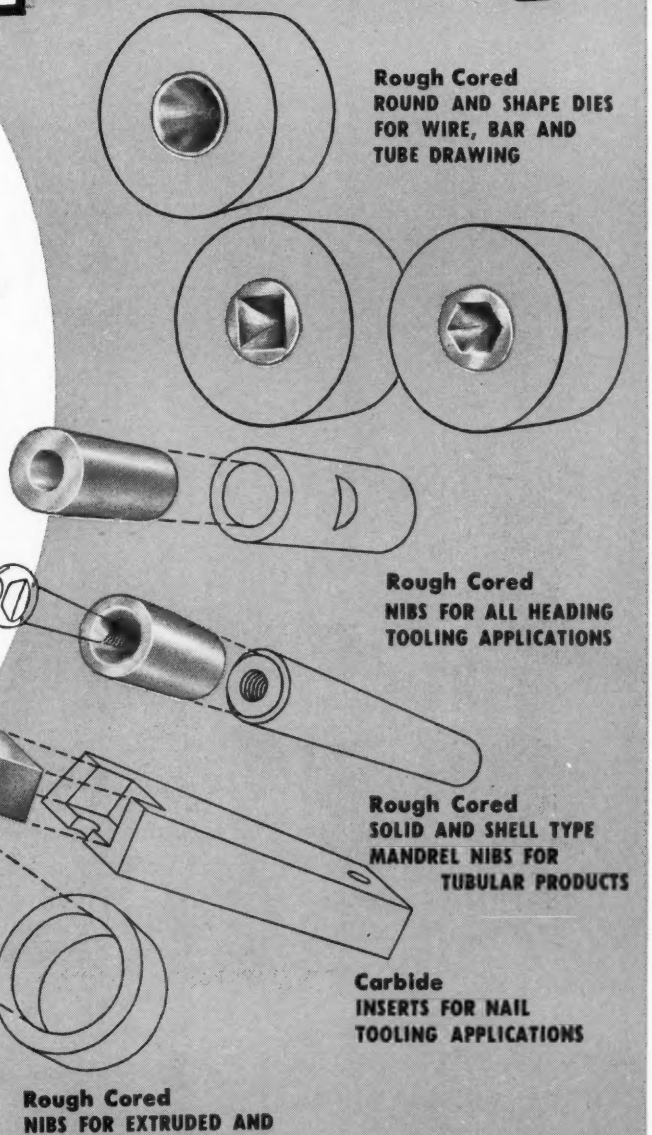

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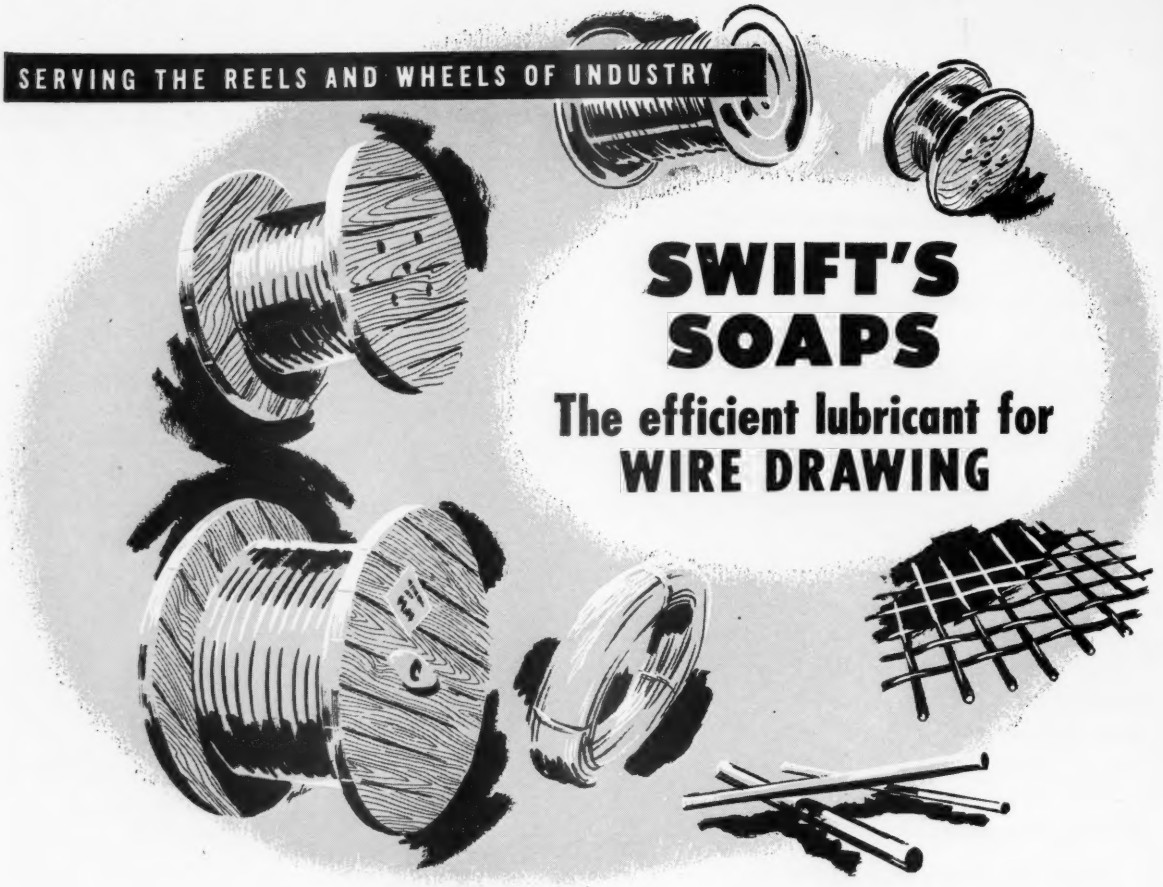

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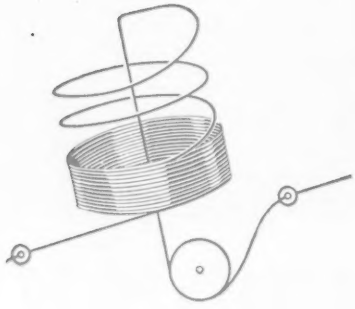

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A monthly publication devoted to the production of Wire, Rod and Strip, Wire and Rod Products and Insulated Wire and Cable.

DRAWING — ROLLING — EXTRUDING — FORMING — FABRICATING

Vol. 29 JULY, 1954 No. 7

Designated as Official Publication By The Wire Association

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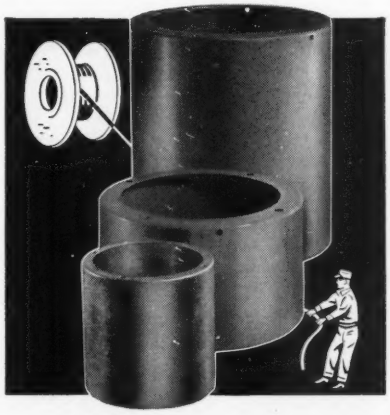

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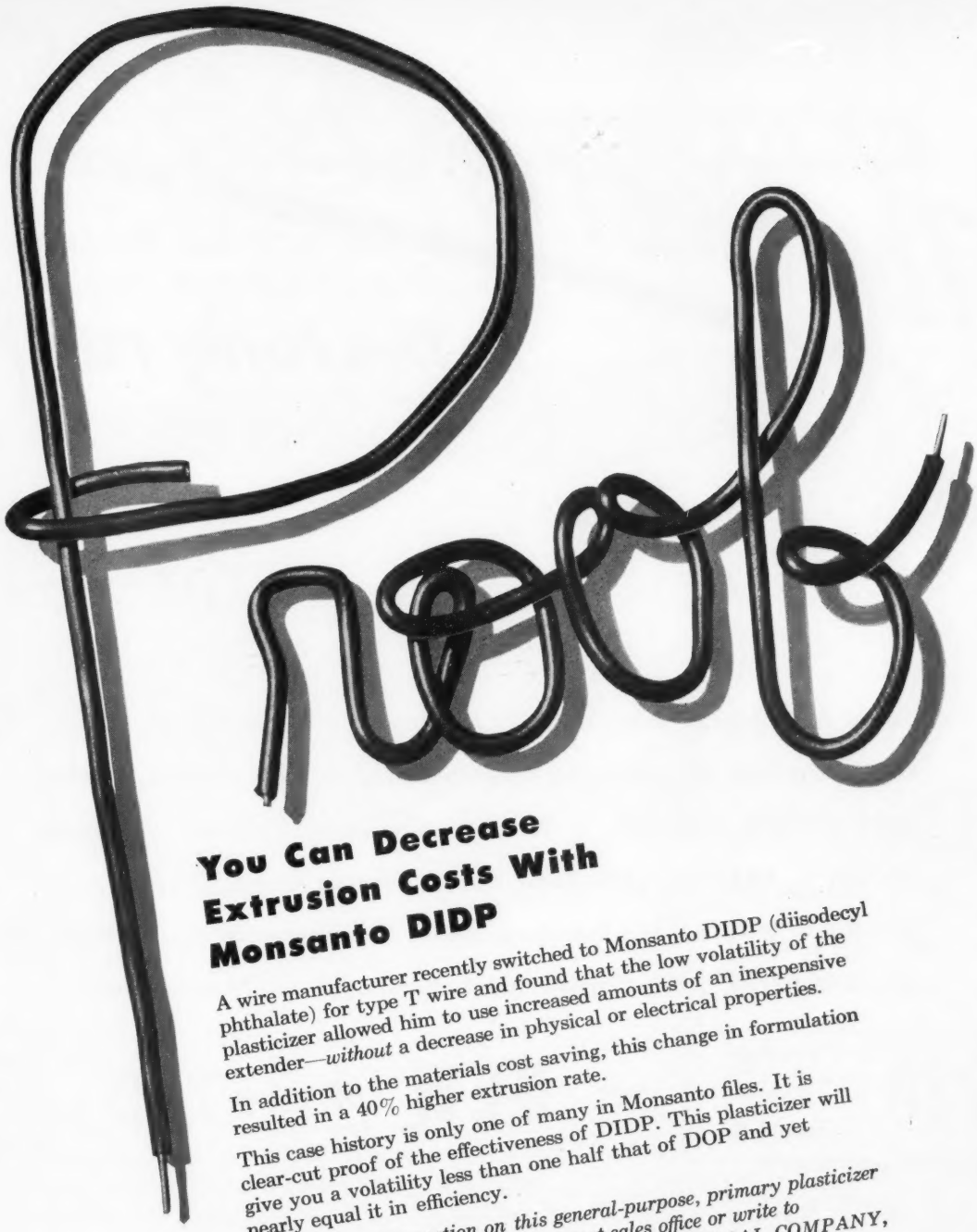

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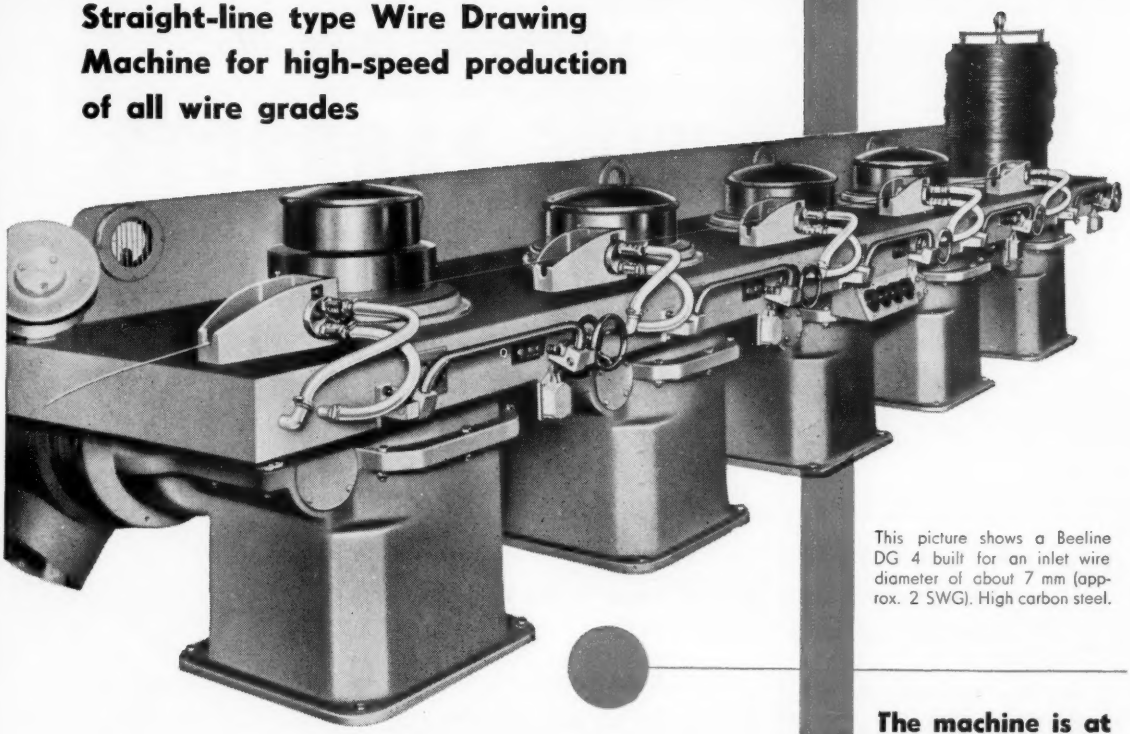

This picture shows a Beeline DG 4 built for an inlet wire diameter of about 7 mm (approx. 2 SWG). High carbon steel.

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The Wire Association will meet in Detroit in 1954, from Nov. 8th through the 11th, at the Statler Hotel. It will feature technical sessions, plant inspection trips, the Annual Luncheon and the Smoker-Dinner.

The issue contains pre-prints of the technical papers to be presented at the Convention and the final program of events. Anything and everything bearing on the Silver Anniversary Convention is included.

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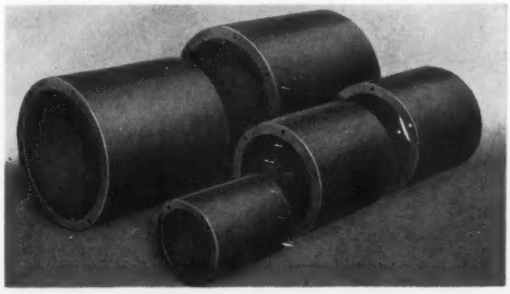

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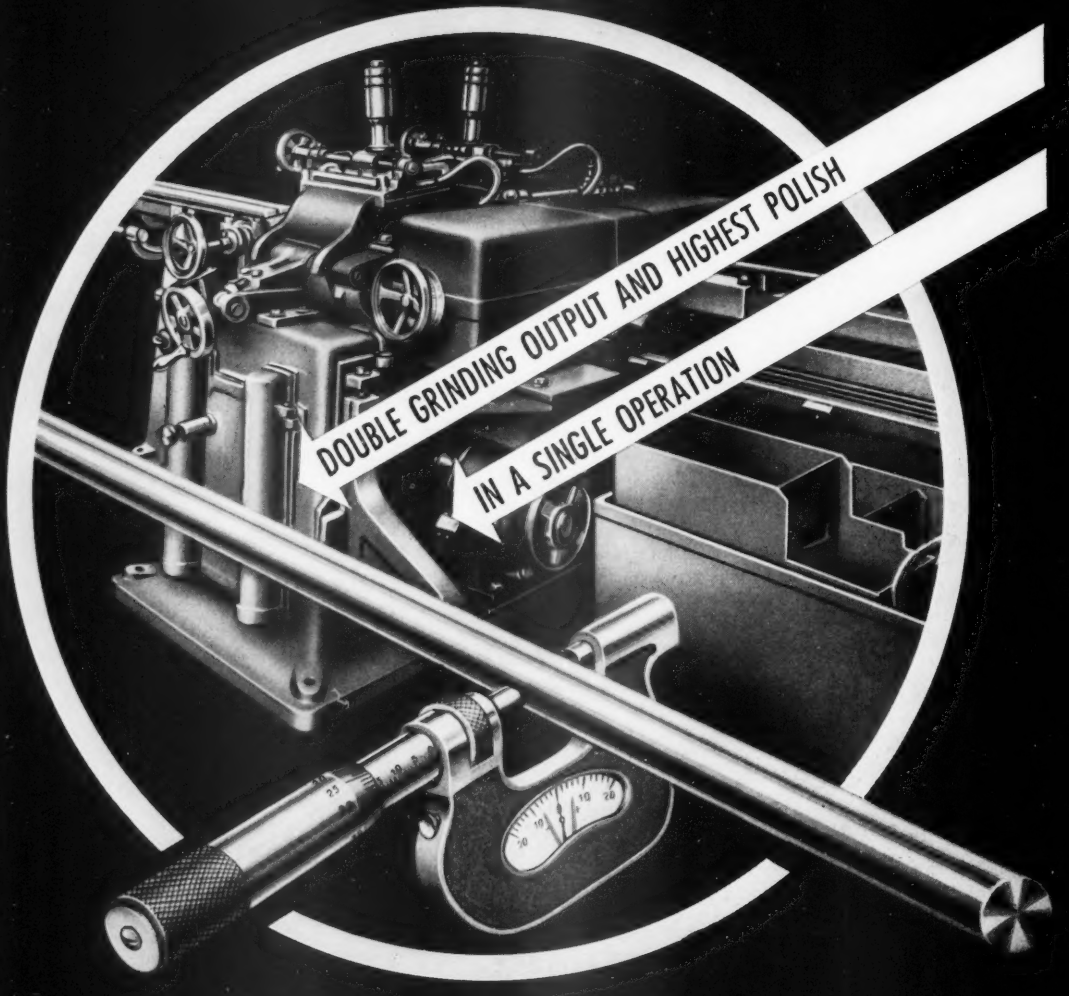

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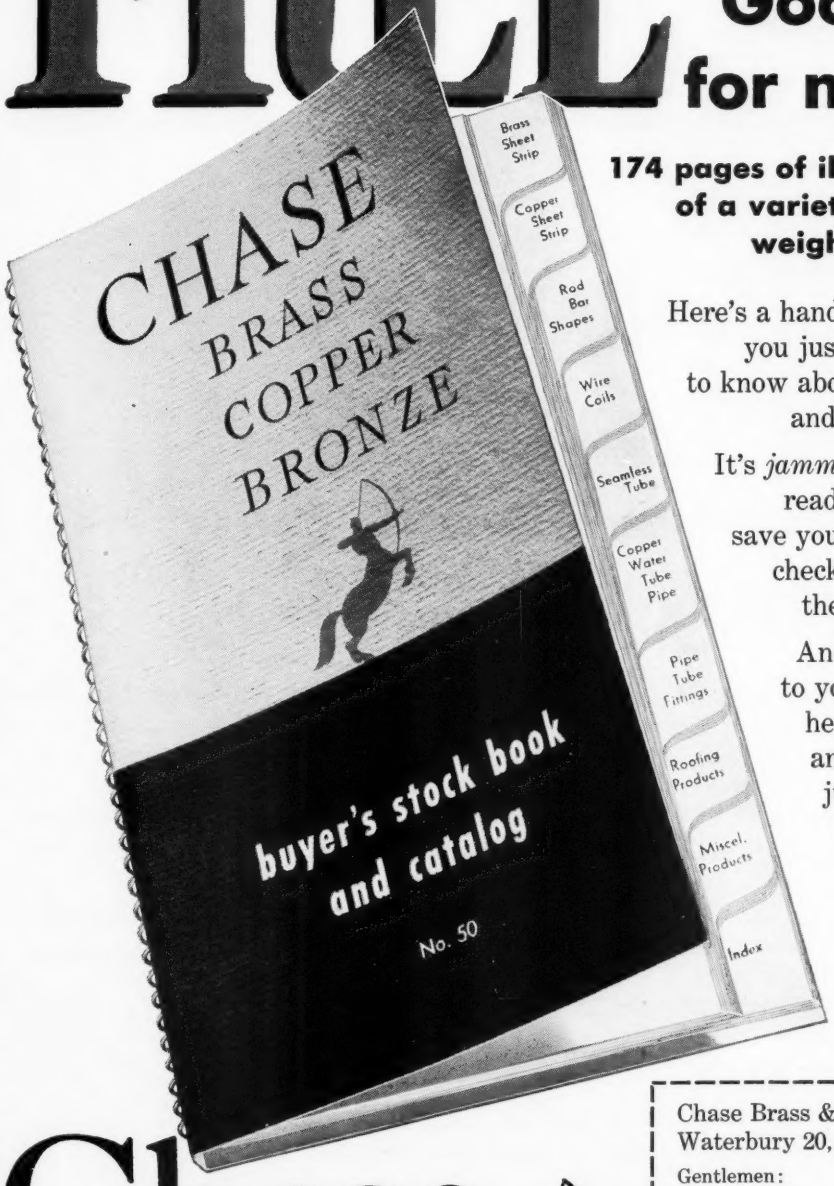

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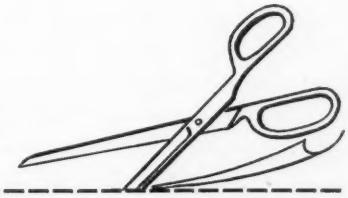

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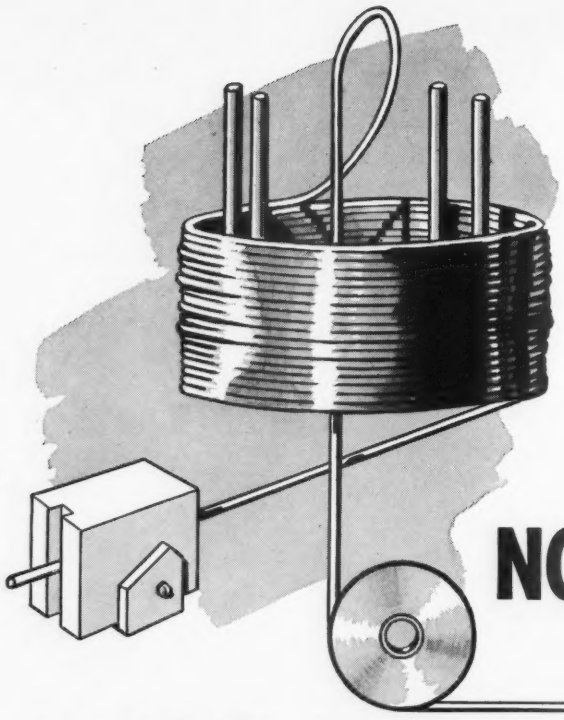

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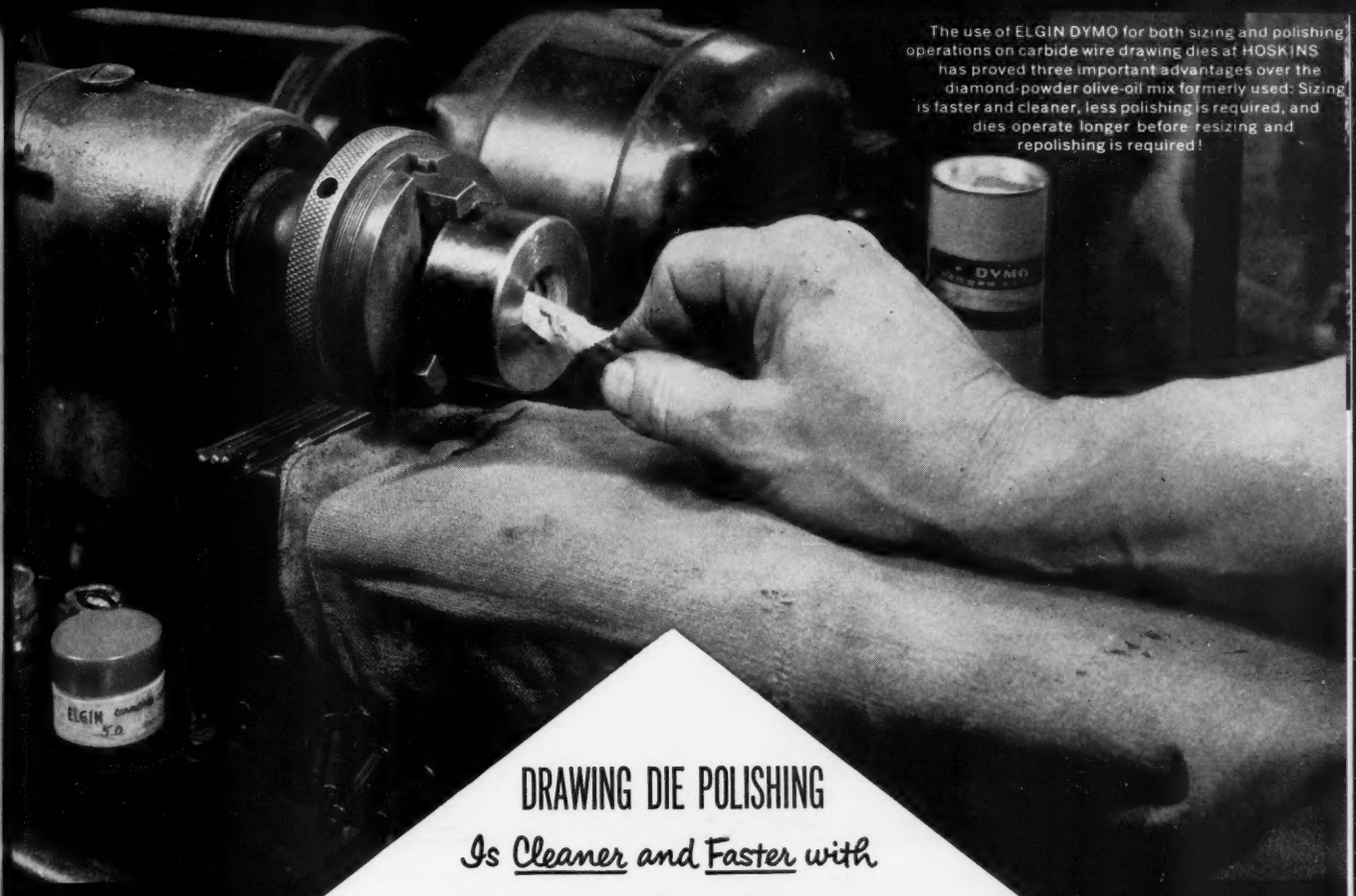

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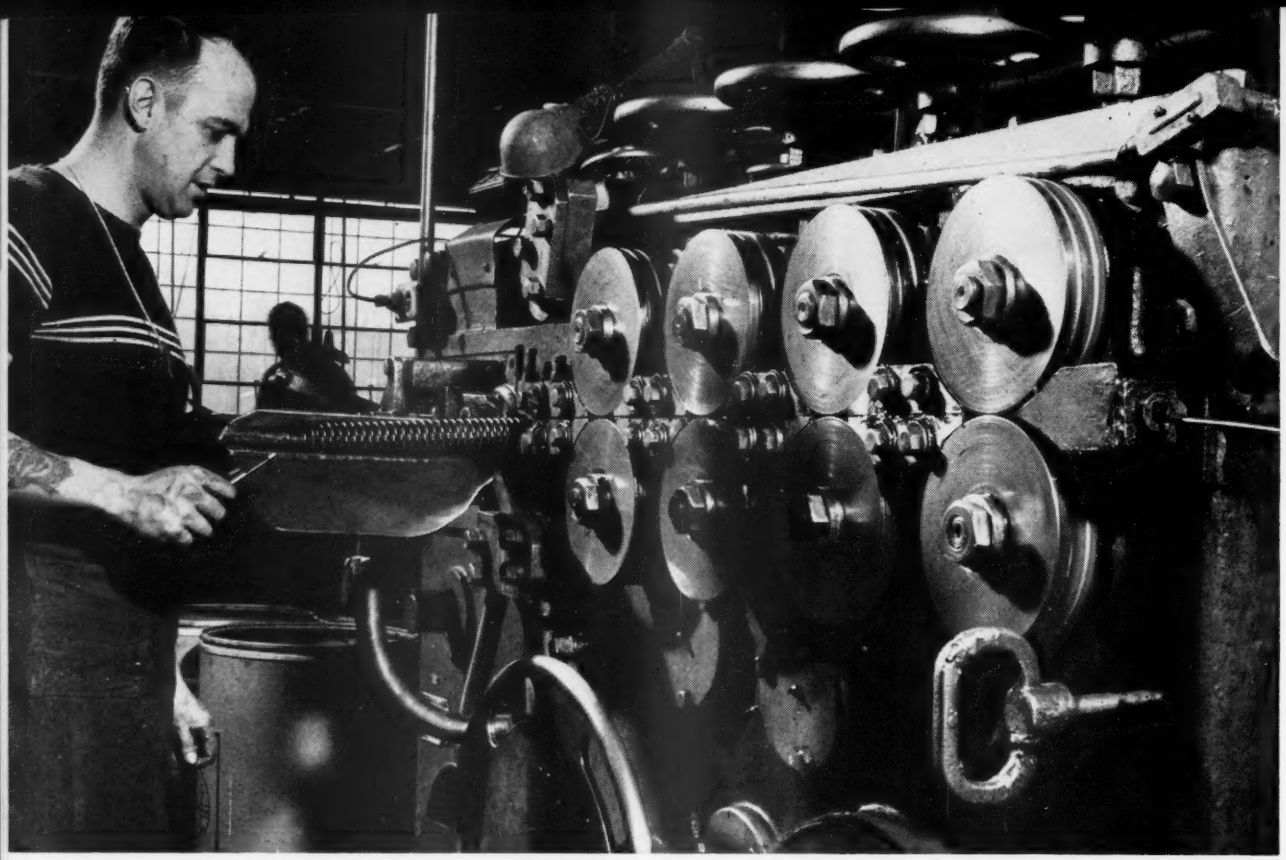


To Make Auto Hood Hinge Springs, straight wire goes in one end (note wire extreme right), a coil spring comes out the other on this high-speed coiler at the Chelsea Spring Division of Rockwell Spring & Axle Co. at Chelsea, Michigan. Here's . . .

How Pittsburgh Steel Helps Chelsea Spring Division Produce High-Quality Springs By The Millions

Intricate Springs, like these automobile trunk latch springs, are less than one inch long yet contain 7 inches of .025-inch diameter music spring wire. They are produced at the rate of about one each second from a No. 1 Sleeper-Hartley torsion coiler at Rockwell's Chelsea Spring Division.

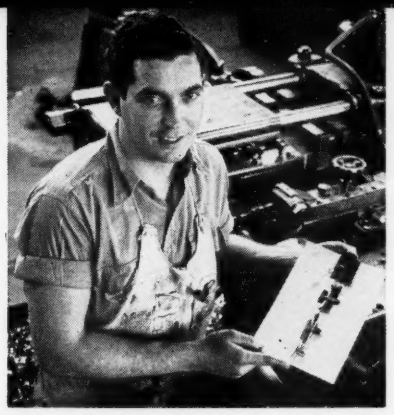
Mass-producing intricate steel springs of many sizes and types, each for a specific function, is a complex job. Here's how Chelsea Spring Division of Rockwell Spring & Axle Co., one of the country's largest spring makers, turns out high quality steel springs by the millions for automotive, appliance, aircraft, and many other industries.

First, Chelsea has experienced engineers and production men who know how to design and produce springs to meet customers' exacting specifications. Second, Chelsea has the finest, latest model, high speed automatic machines to do the actual forming, shaping, producing. Third, Chelsea uses only the finest quality steel wire like that produced by Pittsburgh Steel Company. So, the secret of Chelsea's success is a combination of expertly trained production men, the best machines, and the finest raw materials.

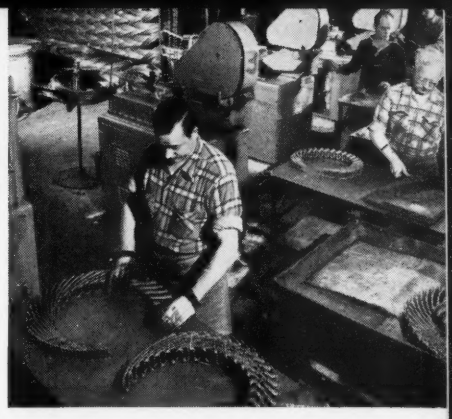
Pittsburgh Steel Company, one of the country's leading producers of high quality steel wire, supplies Chelsea with a wide range of wire products—the kind that can be depended on to meet the requirements of high speed production. The steel has to meet specifications exactly and it must be absolutely uniform from coil end to coil end, and from coil to coil. The slightest variation from absolute uniformity in the wire can cause jamming in the machines, production delays, and costly rejections.

Pittsburgh Steel Company has been a wire producer for over 50

To Keep Auto Upholstery Smooth thousands of wires are formed hourly at Chelsea Spring Division on a Baird No. 2, four slide machine from .047-in. dia. drawn MB spring wire. Finished wires must conform to a tolerance of plus-or-minus .010 on length and form.



Chrome Trim and Ornaments on Your Car are held tightly in place by Rockwell-produced spring clasps like these made from high quality, cold rolled annealed and spheroidized steel strip from Pittsburgh Steel's Thomas Strip Division, Warren, Ohio.



Springs for Your Riding Comfort— These automobile seat springs are shown here emerging from zig-zag forming machines (background) at Rockwell's Falls Spring Division, Detroit. After heat treating and tempering the springs are ready for assembling to auto seat frames.

years. The long experience of its mill men and metallurgists at steel-making from the blast furnaces and open hearths through the final wire drawing and finishing operations, goes into every pound of wire that is made.

On Pittsburgh Steel wire mills at Monessen, Pa., some of the most modern in the industry, are produced such grades as bright basic wire; low, medium and high carbon; all types of annealed wire; ACRS core wire; cold-heading wire; oil-tempered spring wire; and shaped wire.

The wire mills of the subsidiary Johnson Steel & Wire Company at Worcester, Mass., producers of fine wire specialties, have just completed a thoroughgoing modernization. Its range includes aircraft cord wire, armature binding wire, wire for brushes, metal stitching, hose reinforcement, stapling wire, bobby pin wire, tire bead wire, rope wire, oil tempered and MB hard drawn spring wire, and music spring wire right down to sizes as fine as a human hair.

The Thomas Strip Division, Warren, Ohio produces a line of cold-rolled strip steel electrolytically pre-coated with zinc, copper, brass, nickel, lead alloy; hot dip tin and lead-alloy—also annealed spring steel like that shown in photo (second from right, above).

The combined operations of these plants offer the spring maker an unusually broad diversity of high quality steels to select from, assure him fast service to meet a wide variety of applications. Pittsburgh Steel's operations are geared to mesh smoothly with the customers' production line requirements. Oil tempered spring wire, for example, is stocked at Monessen for immediate shipment. If, like Chelsea, you use steel wire in your manufacturing operations, why not talk to a man from Pittsburgh Steel? You will find him at one of the company's district offices near you, or at the home office. A phone call or a letter will bring prompt action. He will be glad to show how you can get the full benefits of Pittsburgh Steel's ability to make the kind of wire you want and deliver it when, how, and where you want it.

A Small Spring can often be vital to the operation of a large unit in today's automobile. These relief valve springs for automatic transmissions are a good example. When compressed to 1.625 inches, the spring must develop a force of 4 pounds with a tolerance of plus-or-minus .02 pounds. Each of these springs made at the Chelsea Spring Division of Rockwell Spring and Axle Company, Chelsea, Mich. must be tested to assure perfect operation.

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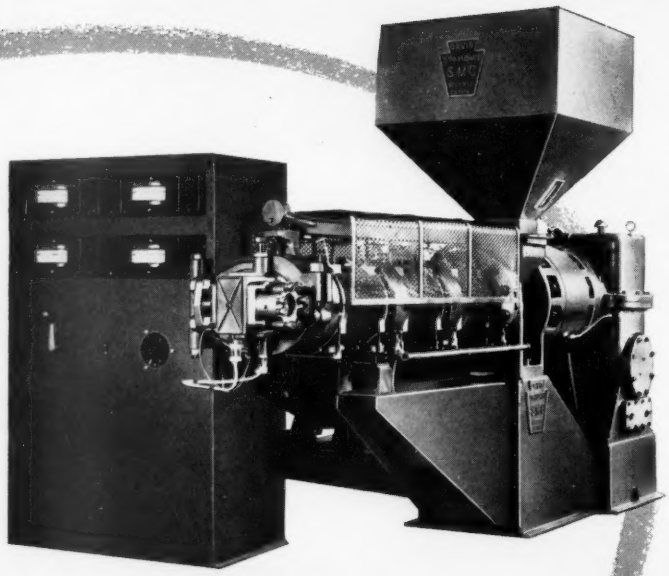

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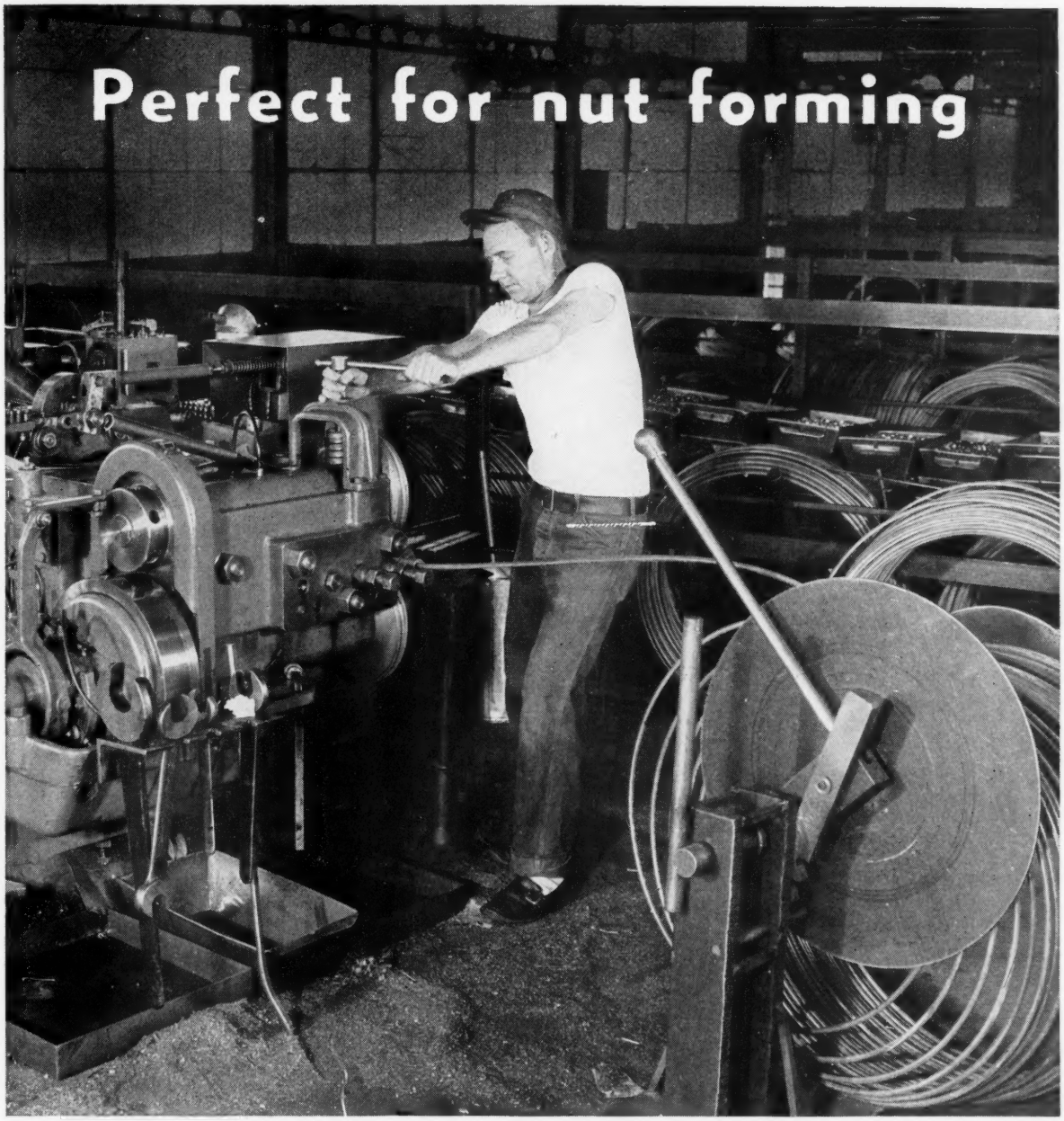

Photo courtesy of Decker Manufacturing Company

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●Youngstown Scrapless Nut Quality Wire is outstanding for its excellent surface and sound internal structure. This uniform high quality results directly from close control of manufacture—from the ore mines clear through to finished product. Thus customers can always be sure that Youngstown wire will stand up under the punishing operations of cold heading, cold punching and thread tapping.

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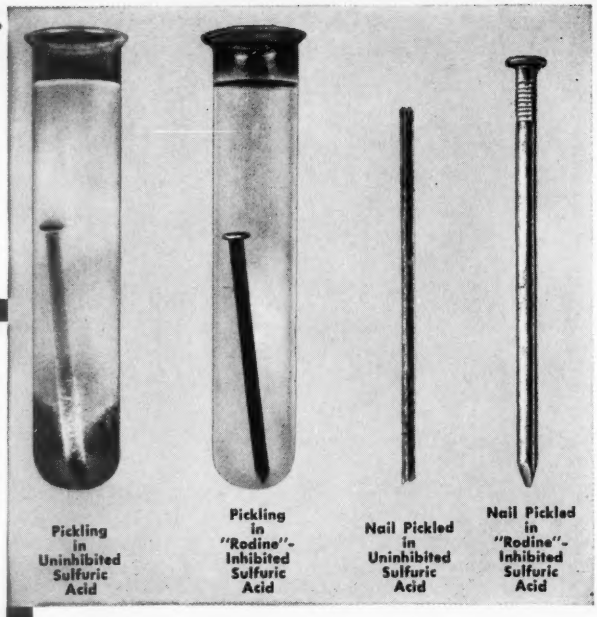
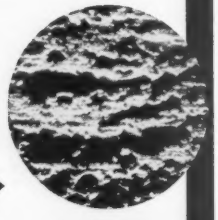

Pickling in Uninhibited Sulfuric Acid
Pickling in "Rodine"-Inhibited Sulfuric Acid
Nail Pickled in Uninhibited Sulfuric Acid
Nail Pickled in "Rodine"-Inhibited Sulfuric Acid

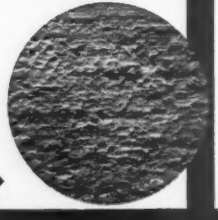
The photographs above illustrate the beneficial effect produced by a small amount of "Rodine" in a pickle bath.

A. Both test tubes contain a 10 per cent by volume solution of sulfuric acid. In the left-hand tube, no further additions have been made to the acid. Notice the gas bubbling off the nail. This is hydrogen, caused by the action of acid on good metal. In the right-hand tube, "Rodine" has been added in an amount equal to 1 per cent by volume of the concentrated acid. Notice the absence of bubbling in this tube. "Rodine" prevents the formation of hydrogen that results from dissolving metal.

B. Both nails after being pickled for the same time. The nail pickled with "Rodine" has lost little weight and has retained its original luster and appearance. The nail pickled without "Rodine" is no longer a nail. "Rodine" prevents the acid from dissolving metal.



This steel surface was pickled in an uninhibited acid bath. Note the deep pits, and that the surface is visibly crystalline.



This surface was pickled exactly like the one above except that "RODINE" was added to the acid solution. Only scale pockets and roll marks are visible; no pitting occurred.

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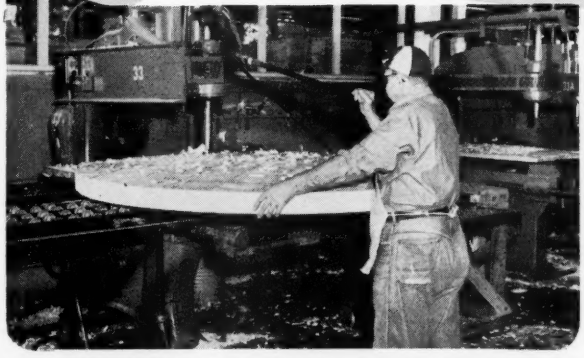

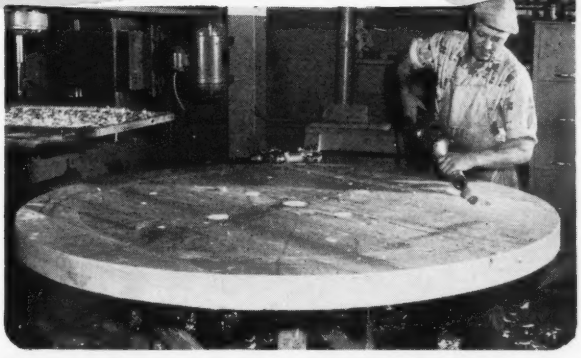

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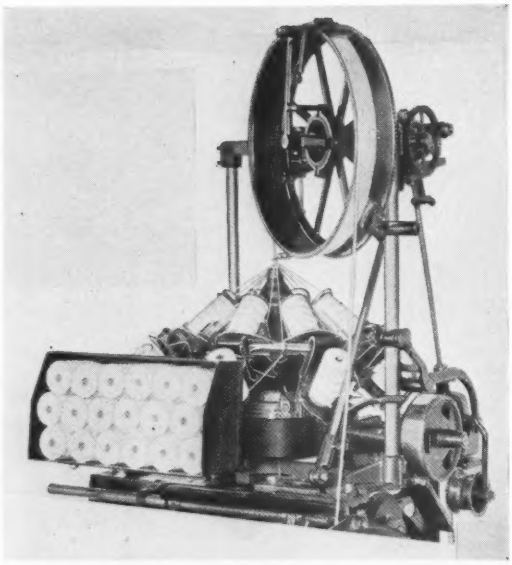

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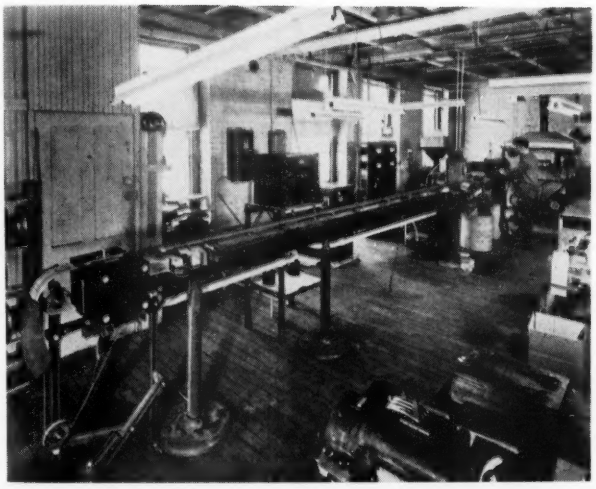

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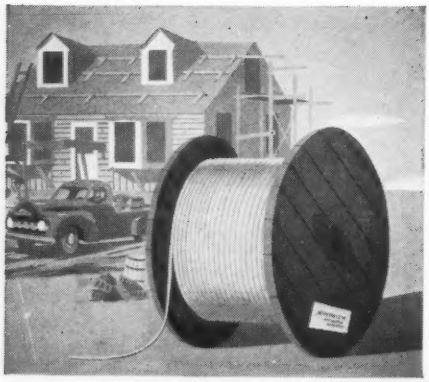

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CELANESE PLASTICIZER	GRADE	APPEARANCE	COLOR APHA Max.	SPECIFIC GRAVITY @ 20/20° C.	ACIDITY	ESTER VALUE % Min.	PERMANGANATE TIME, Min. (in Minutes)	REFRACTIVE INDEX @ $n\frac{20°\,C.}{D}$
LINDOL* tricresyl phosphate coal tar base	Technical	Clear transparent liquid	75	1.165 ± .005	0.01 (3)	99	30	1.556
CELLUFLEX* TPP triphenyl phosphate	Technical	White flakes	20 (4)	1.221 (1)	0.003 (3)	99	30	1.550 (6)
CELLUFLEX* 179C tricresyl phosphate petroleum base	Technical	Clear transparent liquid	150	1.165 ± .005	0.01 (3)	99	30	1.553 (6)
CELLUFLEX* 112 a mixed ester	Technical	Clear transparent liquid	40	1.210 ± .005	0.01 (3)	99	30	1.560 (5)
CELLUFLEX* DBP dibutyl phthalate	Technical	Clear transparent liquid	50	1.045 ± .001	0.01 (2)	98	—	1.4889
CELLUFLEX* DOP dioctyl phthalate	Technical	Clear transparent liquid	50	0.985 ± .002	0.01 (2)	98	—	1.4859

(1) @ 60/60° C. (2) % as phthalic, max. (3) % as phosphoric, max. (4) Molten (5) @ $n\frac{25°\,C.}{D}$ (6) @ $n\frac{60°\,C.}{D}$

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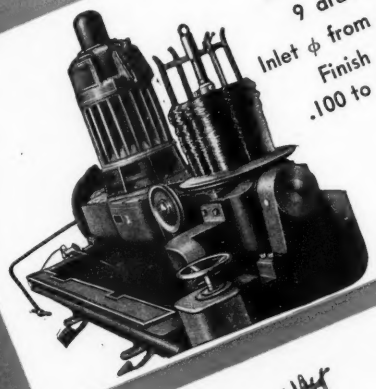
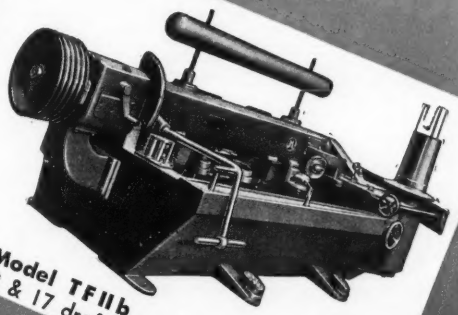
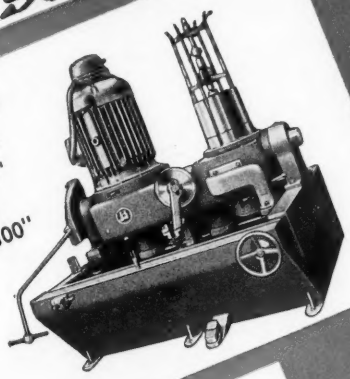
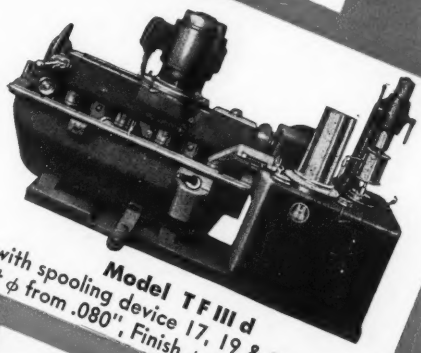




Model TF IIb
13 & 17 drafts Finish ϕ .050 to .140"
Inlet ϕ from .120"

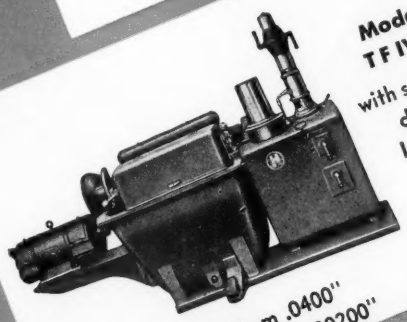
Model TF IId
9 & 11 drafts
Inlet ϕ .120"
Finish ϕ .065 to .0300"





Model TF IIId
with spooling device 17, 19 & 21 drafts
Inlet ϕ from .080", Finish ϕ .0140" to .00400"

Model TF IV b
with spooling device
19 drafts



Inlet ϕ from .0400"
Finish ϕ .00800" to .00200"

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with spooling device
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Inlet ϕ from .00400"
Finish ϕ .00240" to .00120"

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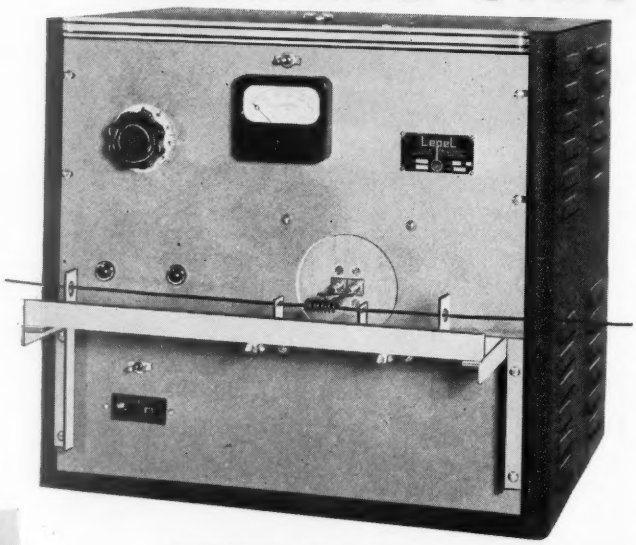
The Lepel Model T-1-W is also ideally suited for heat treating thin parts such as surgical needles and dental burrs, and joining various types of wire products.



MODEL T-1-W

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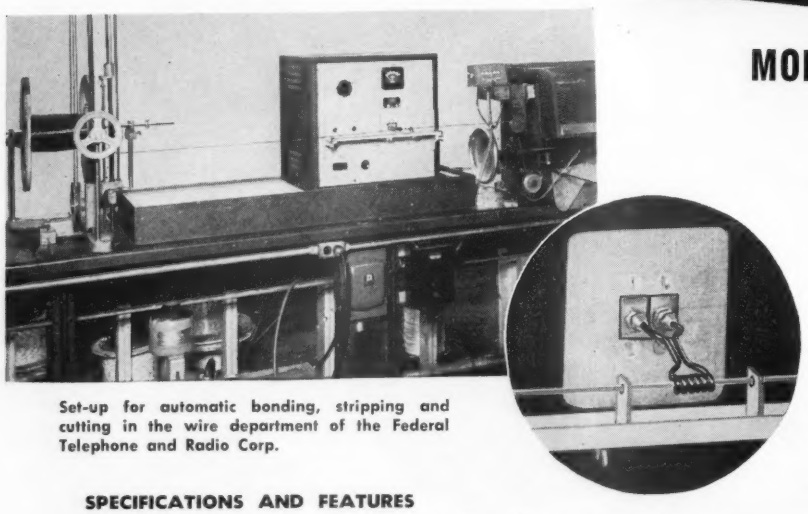
F. O. B. FACTORY



Set-up for automatic bonding, stripping and cutting in the wire department of the Federal Telephone and Radio Corp.

Enlarged view of the coil arrangement with the insulated wire passing continuouly through the heating coil.

SPECIFICATIONS AND FEATURES

The power input is 1.6 KVA at 115 volts, 60 (or 50) cycles, single phase.
A stepless Thyratron Control is incorporated to adjust output power for heating various thicknesses of wire and other parts.
The water consumption is negligible, requiring but a fraction of a gallon per minute. Ordinary tap water pressure is sufficient.
As a precautionary measure, a magnetic trip circuit breaker protects the generator from overloading.
This unit can be operated by a footswitch or with an automatic timer.
Dimensions: 21" wide, 18" high, 15" deep. Weight: 150 pounds.

All Lepel equipment is certified to comply with the requirements of the Federal Communications Commission.

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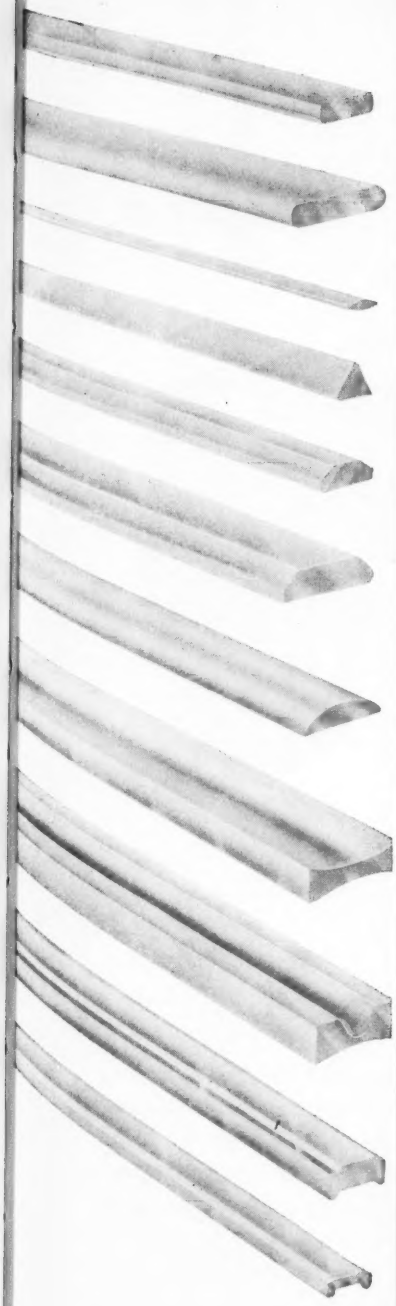

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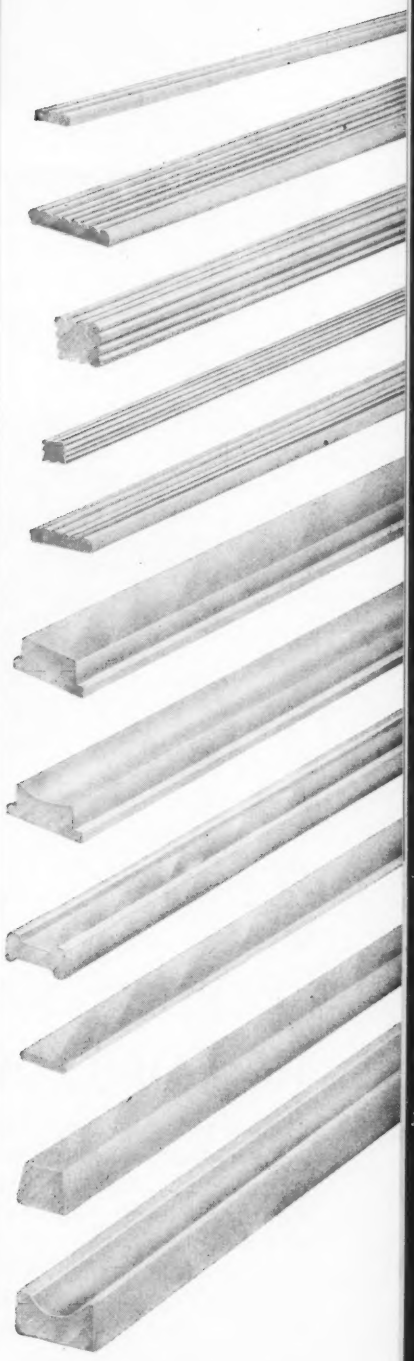

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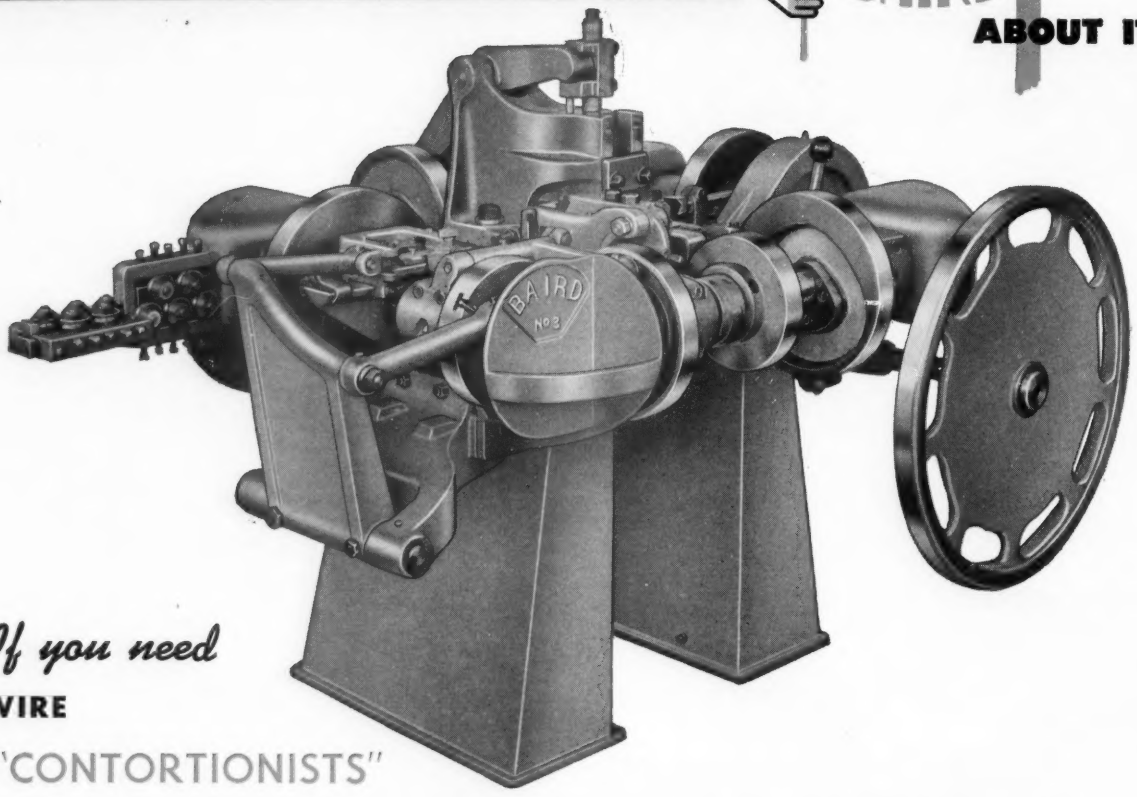

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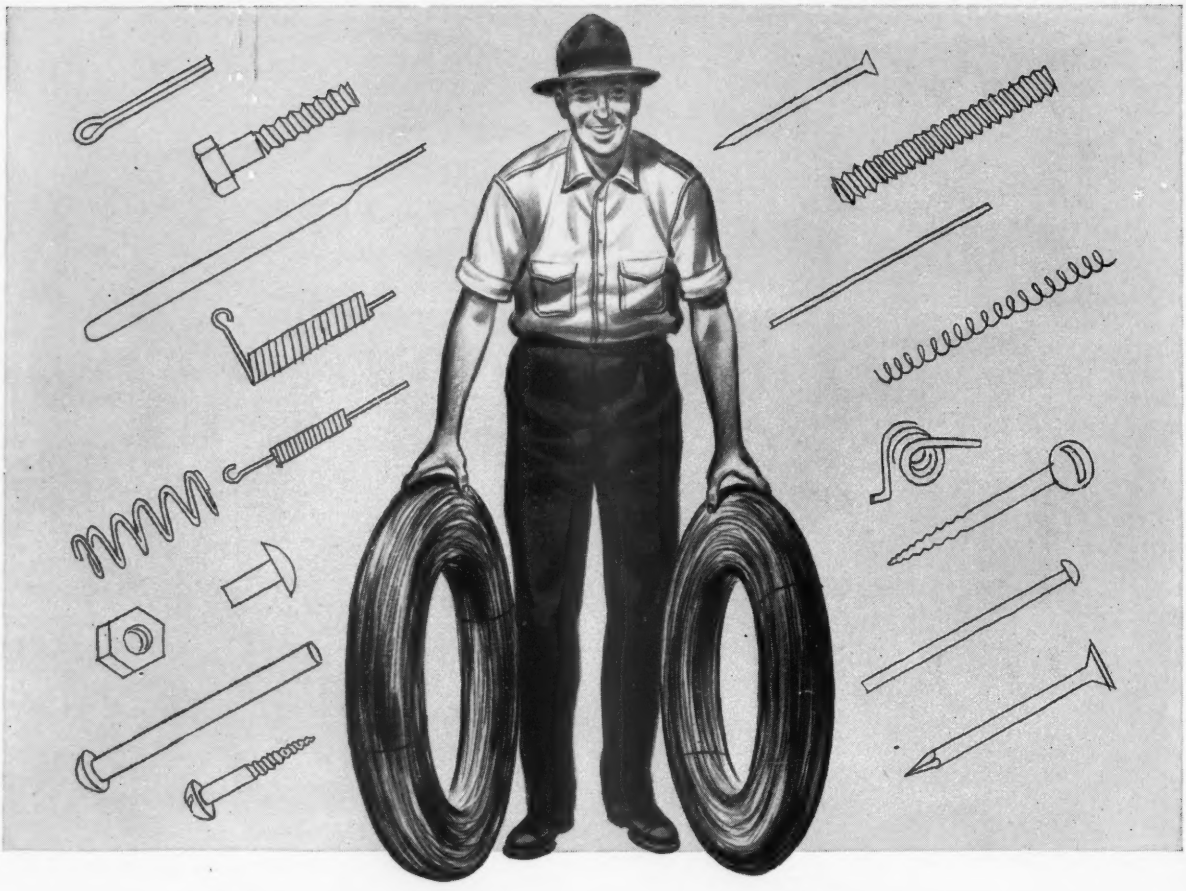

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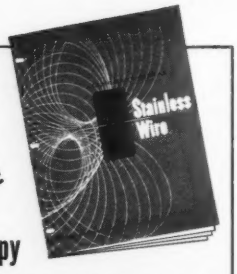

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MODEL 128

Look! No Hands!

One continuous 600 pound strand* automatically packaged!

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Fine Wire	High Carbon Steel	Coarse Wire
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SPEEDS to suit all materials and operations.
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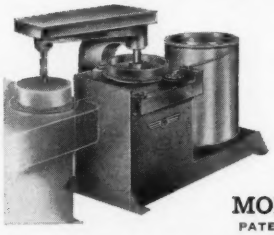

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PATENT PENDING

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Other machines are available for continuously drawing and packaging fine and coarse wire.

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The Wire Outlook

Not only has the business slide leveled off, but a slight up-turn was recorded for June. The year started on a weak tone, with many doubts as to what would actually happen, and now it seems apparent that the earlier prognostications of a strong finish, beginning after the summer doldrums, will be fulfilled. There will be no sharp upsurge of business, but rather a gentle and general betterment in most lines.

This outlook is partly based on the psychological attitude of both employers and employees, most of whom appear to be reasonably optimistic. There has been no panic as a result of the readjustment through which we have been going and the consuming public has been buying on a healthy scale.

Some of the major signs of good business ahead are: construction contract awards have been setting new records; home building is still booming and sales are holding up well; new orders to manufacturers are steadily rising; from April through June production showed its first definite rise since mid-'53; prices are showing a tendency to stabilize, especially on raw materials; consumer credit has increased; and automobile sales have been unexpectedly good, now assuring a five million car year.

Profits for the year are not expected to be as good as in the past few years, due principally to stiff competition, and "unemployment" figures will look worse in the summer, as a result of the large numbers of young men and women who graduate from schools and who, until they secure jobs, will be classed among the unemployed.

The international picture is cloudy and while the prospect of our involvement in foreign wars is like the sword of Damocles, there is some hope that we can avoid a shooting war and bring about a peace of sorts through negotiation. At this writing, little is hoped to result from the Geneva conference, but we are given a 50-50 chance of avoiding military engagement of our own armed forces.

The Reds would like to see us squander our men and resources on foreign wars and, indeed, it is part of their long-range plan to egg us on into one situation after another on foreign soils to bring about a weakening of our economy to a point where they can "take over." Let us hope that our leaders will not be inveigled into becoming the victims of such Machiavellian maneuvers.

Wire consumers are beginning to buy somewhat beyond their immediate needs. Orders are usually small and for prompt deliveries. Most wire being purchased is for immediate use. Both manufacturers wire and merchant wire products continue on the buoyant side, for the latter, principally due to seasonal demand. It is reported that imports of wire are increasing.

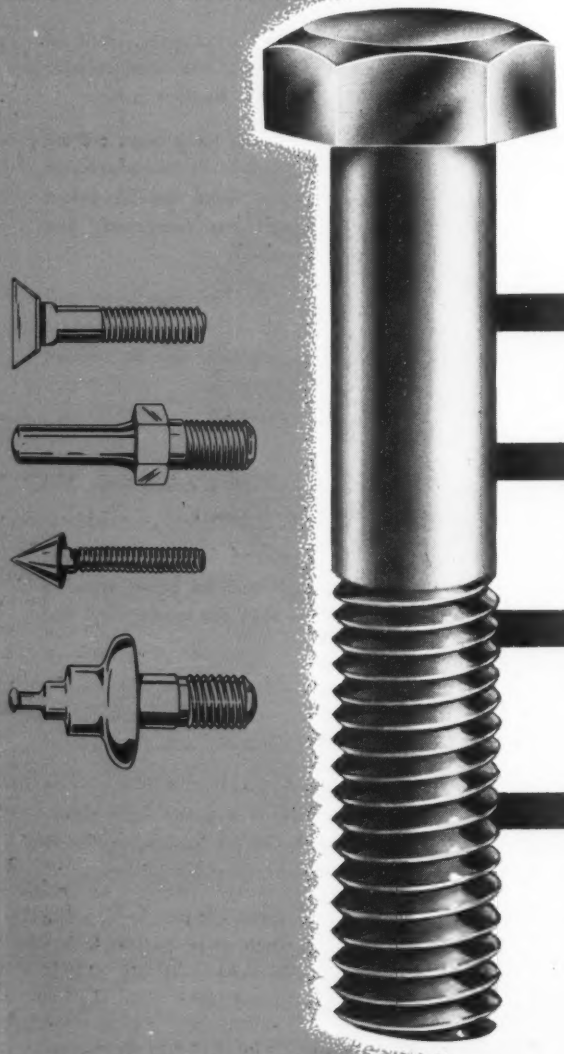
Steel production is making steady gains and, even though on the moderate side, it is in the right direction—up. Despite a decline in the production of refined copper, domestic deliveries are increasing. With the increase in capacity for aluminum production, there should be plenty of this metal for all uses.

Two bills aimed at the control of subversive organizations and activities have been placed before the Congress with the endorsement of the Attorney General. It would definitely seem that the time has arrived and, in fact, is long overdue, for our country to have laws with teeth in them that will enable both business and government to deal summarily with these traitorous trouble-makers.

Major trends move slowly, but when they advance toward desirable goals, through each individual doing his best, we can feel reasonably assured that the outcome will be favorable.

—from the Editor's Desk

Steelskin RESEARCH Announces a NEW series of CE* Lubricants!



Proven by 2 years of production use in several mills, this *completely new* approach to cold-heading lubrication is now introduced to the cold extrusion industry. If you have been using aluminum stearate-lime mixtures in your cold-heading operations, you will want to try STEELSKIN CE* on your job for several reasons:

UNIFORMITY OF PRODUCT

STEELSKIN CE* cannot become segregated or separated. It is a chemically homogeneous product made by an *exclusive* STEELSKIN process.

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STEELSKIN CE* has the same free-flowing granular properties of other STEELSKIN dry powders. The dense powder rolls freely in the die box, but it *does not run out* like fluffy mechanical mixtures.

LUBRICATION PROPERTIES

A non-separable product, STEELSKIN CE* retains its uniform chemical composition during shipment and *in the die box*. Therefore, you get a uniform finish. And no matter what kind of a cold-heading job you have, one of the STEELSKIN CE* series can be depended upon to do the job.

COST INFORMATION

A custom-made product like STEELSKIN CE* usually commands a premium price. STEELSKIN CE* *actually costs less* than conventional mechanical mixtures. In addition, you have no mixing problems and you are guaranteed the same uniform product every time.

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WIRE
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DRAWING — ROLLING — EXTRUDING — FORMING — FABRICATING

Vol. 29 JULY, 1954 No. 7

The Impact of Current Economic Conditions on the Wire Industry

by E. C. Van Syckle
Manager of Manufacturers Wire Sales
Pittsburgh Steel Company
Pittsburgh, Pennsylvania

In these timely comments upon current economic conditions, the author describes how his and some other companies have modified their production and distribution policies to meet the new circumstances brought about by open capacity and keen competition.

For one year now manufacturers' wire, steel wire for springs and other formed wire products, have been in easy supply. Wire producers have been operating through most of this period at less than capacity. They have been out eagerly scrambling for business, and competition has been more intense than for any period during the past 14 years.

★ ★ ★

It all started last spring, as spring makers and other wire fabricators began trimming inventories. These buyers began having new opportunities to be selective, and to bargain for increased quality, better service and lower price. They were beginning to face increased competition in marketing their own products. It became essential for them to take full advantage of their position to get the best from steel producers at lowest cost.

★ ★ ★

Lately business has begun to swing upward again. Manufacturers have been getting more orders. Because inventories are low, steel producers felt the upturn almost immediately. Perhaps it is only a seasonal upswing; perhaps it is more than that. This much is certain, however: Adjustments of the past year will have a lasting affect both on steel producers and on wire fabricators, no matter which way the markets swing.

E. C. Van Syckle

★ ★ ★

Although these adjustments are continuing, many major changes have occurred in producer-manufacturer relationships during the past year. There has been much soul searching. Technological advances have acquired new and vital importance. Out of this is emerging a stronger combination of industry, an era of greater teamwork and development.

What Happened?

Last spring found many steel producers in this position. They had recently completed modernization programs. In some cases facilities had been expanded. The biggest advance, however, had been installation of new equipment to

produce steel wire of better quality faster and at less cost. The purpose was to offset partially the rising costs of labor and materials and to keep prices low.

★ ★ ★

Since World War II, the steel industry's capacity to produce manufacturers wire increased from 5.8 million tons annually in 1946 to 6.2 million tons annually in 1953. This reflects only a small part of the millions of dollars invested in new steel making facilities and wire producing equipment.

★ ★ ★

Pittsburgh Steel provides a good example of this:

(1). To an already existing nucleus of modern wire mill facilities a new galvanizing unit was added to increase production of galvanized wire.

(2). In 1948, new wire drawing equipment was installed to further modernize and increase production.

(3). To improve the quality of high carbon wire a modern patenting unit was added in 1950.

(4). Supplementing this, ten new 6/7 H.R. wire drawing machines and six new 4/5 H.R. wire drawing machines were installed to make increased quantities and better quality high carbon wire.

(5). For the production of oil tempered spring wire, two modern oil tempering units were also installed in 1950.

(6). Many minor additions and changes have taken place in the last few years involving the purchase of new equipment, revamping existing equipment resulting in improved quality, packaging, and service to the buyer.

★ ★ ★

All the way through our plants, then, from raw materials to the final shipment of manufacturers wire, plant facilities have been thoroughly implemented. In addition, our range of wire products has been broadly diversified.

★ ★ ★

Today at Monessen, Pittsburgh Steel is making bright basic wire; low, medium, and high carbon; all types of annealed wire; galvanized wire; rope wire; ACSR core wire; cold heading wires of all types; chain wire; strand wire; welding wire; tire bead wire; oil tempered spring wire; hard drawn MB spring wire; flat wire and shaped wire. The company is also fabricating wire into lawn fence, farm and poultry fence, chain link fence, barbed wire and nails; and construction products such as Steeltex and welded wire reinforcing fabric.

★ ★ ★

This range is supplemented by Johnson Steel and Wire's fine wire specialties which include: aircraft cord wire; armature binding wire; wire for brushes, metal stitching, hose reinforcement, staples; bobby pins; tire bead wire; rope wire; oil tempered and hard drawn MB spring wire; music spring wire right down to sizes as fine as a human hair.

What This Meant?

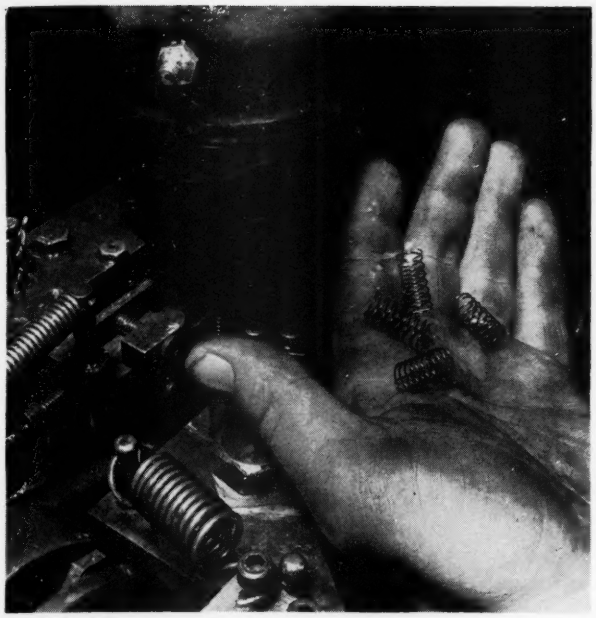
Since 1946, then, Pittsburgh Steel's investment in improved steelmaking and wire producing equipment has been a large one. It has expanded capacity a little, and has greatly improved the company's ability to make more steel products of better quality. From a practical standpoint, it has transformed an old company name in steel into a new steel company.

★ ★ ★

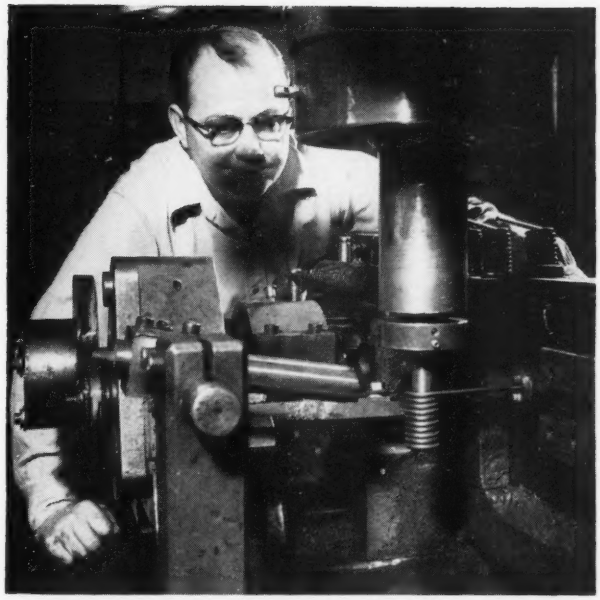
Such an investment, naturally, means incurring financial obligations. One obvious way to repay these obligations, is to work equipment on the most efficient and economical operating cycles consistent with customer requirements, and utilizing as many finishing operations as consistent with customer requirements.

Neil C. Talmage (left), Chief Engineer, L. A. Young Spring and Wire Corporation discusses wire quality with John Cross, Pittsburgh Steel Company representative. Closer teamwork between steel wire producers and wire fabricators is being accomplished throughout the industry. * *

A small spring can often be vital to the operation of large units in today's automobiles. This relief valve spring for an automatic transmission provide a good example. Made of 041-inch diameter oil tempered spring wire, over 27-inches of wire is coiled on this No. 1 Torrington into a spring wire containing 26 inches. When compressed to 1.625 inches, the spring must develop force of 4 pounds with a tolerance of plus-or-minus .02 pounds. Each of these springs made at the Chelsea Spring Division of Rockwell Spring and Axle Company, Chelsea, Michigan, must be tested to assure perfect operation. Mass production requires complete coordination betwen fabricator and steel producer. * * * * * * * * *



Intricate spring, such as these automobile trunk latch springs, formed to a tolerance of plus-or-minus, .005 inches in length and .007 inches in body diameter, are produced at a rate of up to 1,500 an hour on this No. 1 Sleeper-Hartley torsion coiler at Rockwell's Chelsea Spring Division. * *



When pressure is released on the brake shoes in your car, a return spring restores the brake shoes to the ready position. On this Sleeper-Hartley torsion coiler 37 inches of .200-inch diameter oil tempered spring wire is formed into a 9-3/4 coil spring that is 3-5/32 inches long. When the spring is extended to 4-7/32 inches long the spring develops a pull of 268 pounds. Operator is John Derra, who has fabricated springs for the L. A. Young Spring and Wire Corporation for over 25 years. Into the wire he uses goes years of skill and experience of steel men in the wire mills. * * * * * * * * * * * * * * *

While steel wire was in high demand, this was not hard to do. Heavy backlogs and long lead time in ordering, permitted mill schedules to be shaped up for maximum production and efficiency.

★ ★ ★

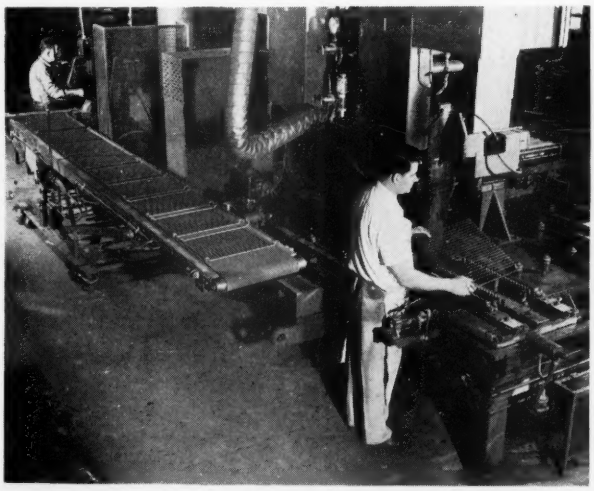
When demand began to ease off last spring, this picture changed fast. Backlogs of orders at the mills dropped off sharply. Lead time shortened until gradually steel wire became available on what amounts to an immediate delivery basis. At the same time, wire fabricators were successful at trimming some of the finishing requirements on the wire they bought, and generally scrutinized quality more closely.

★ ★ ★

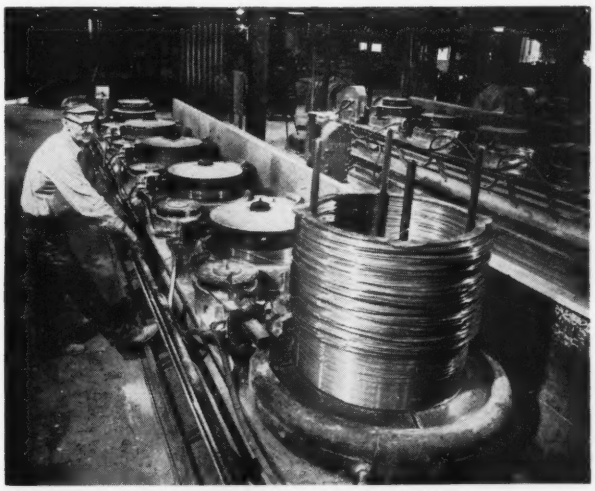
The big adjustment was on. Springmakers and wire fabricators looked through their records closely, balancing the merits of one steel producer with those of another. Wire from one producer was pitted against wire from another in production runs on springmaking and fabricating equipment. Close tally was kept on delivery performance. Prices and freight rates got a thorough going over and were shrewdly negotiated.

What Was Accomplished?

To mills such as Pittsburgh



One trend among wire users is for springmakers and producers of component parts, to make more finished formed wire products. Here at L. A. Young Spring and Wire Corporation, nickel plated oven racks made of bright basic wire, are fabricated on an automatic resistance welding line.



New batteries of wire drawing machines such as this new unit have been installed throughout the wire drawing department at Pittsburgh Steel's Monissen, Pa., Works. * * * * * * * * * * * * *

Steel, who had geared with new equipment to meet just such competitive conditions, the adjustment was not altogether without its blessings.

★ ★ ★

No company likes to see its operating rates fall off, and at the same time find its costs going up. But under these circumstances, steel companies have found out that they can successfully undertake operating procedures they have been skeptical of in the past, and can use their equipment to advantage in many new ways.

★ ★ ★

Here are some examples. Production of wire rods, for many years, had been scheduled on a monthly rolling cycle. At the beginning of the month the mill started on rolling large gages, and for the first two weeks worked progressively downward to the smallest gages of the range. For the next two weeks, starting with the smallest gages, they rolled progressively larger gages until they reached the top of the range.

★ ★ ★

Now rolling schedules are being successfully accomplished on a two week cycle, rolling from large gages down to small during one week and working back up the range during the second week. This enables the steel producer to produce and ship a variety of

Although springs are mass-produced, each is built to give an individual account of itself. Here are Precision Spring Corporation, conical springs of oil tempered spring wire used in universal joints to adjust the length of the universal shaft are tested to come within a length tolerance of plus-or-minus .010 inches. The base diameter must be plus-or-minus 1/64 of an inch, and the top diameter must be plus-or-minus .005 inches. * * * * * * *

gages in up to two weeks less time than has been required in the past. In fact, it is often possible to ship an order within a week to ten days after the order is received, when the customer needs it urgently.

★ ★ ★

To further speed shipments, some mills have found it useful to carry limited stocks of certain grades in the size ranges most often ordered. Pittsburgh Steel, for instance, stocks a healthy tonnage of oil tempered spring wire in a wide range of sizes ready for immediate shipment to fill out an order.

★ ★ ★

There have been other improvements, both in service and in inspection, too numerous to describe here. All of them add up to an increased effort by steel wire producers to dovetail their production more closely with production lines at the plants of spring makers and wire fabricators, to the mutual advantage of both.

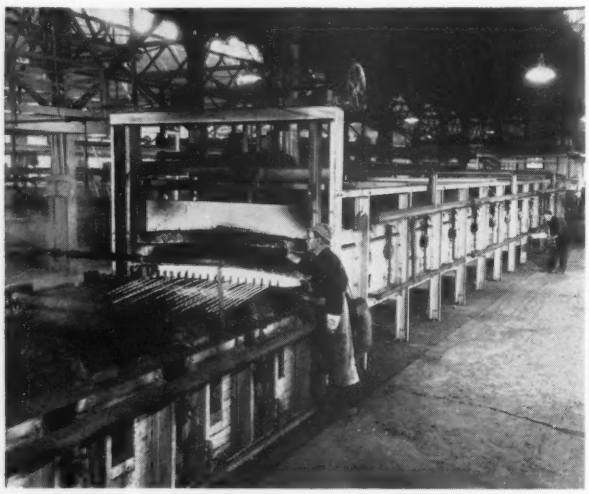
How it is Working Out?

To manufacturers, these adjustments by the steel wire producers have been very valuable. They have enabled the manufacturers to hold their inventories low, speed production, and improve the quality of their products—all of which are vitally important in meeting the competition of today's markets for fabricated wire products.

★ ★ ★

Take, for example, some of the large spring manufacturers. To a skilled springmaker, steel wire springs are virtually living, breathing organisms. He sees them absorbing, store, and releasing energy. He intimately understands the torsion waves travelling up and down through the active wire as it vibrates during operation.

(*Please turn to page* 767)

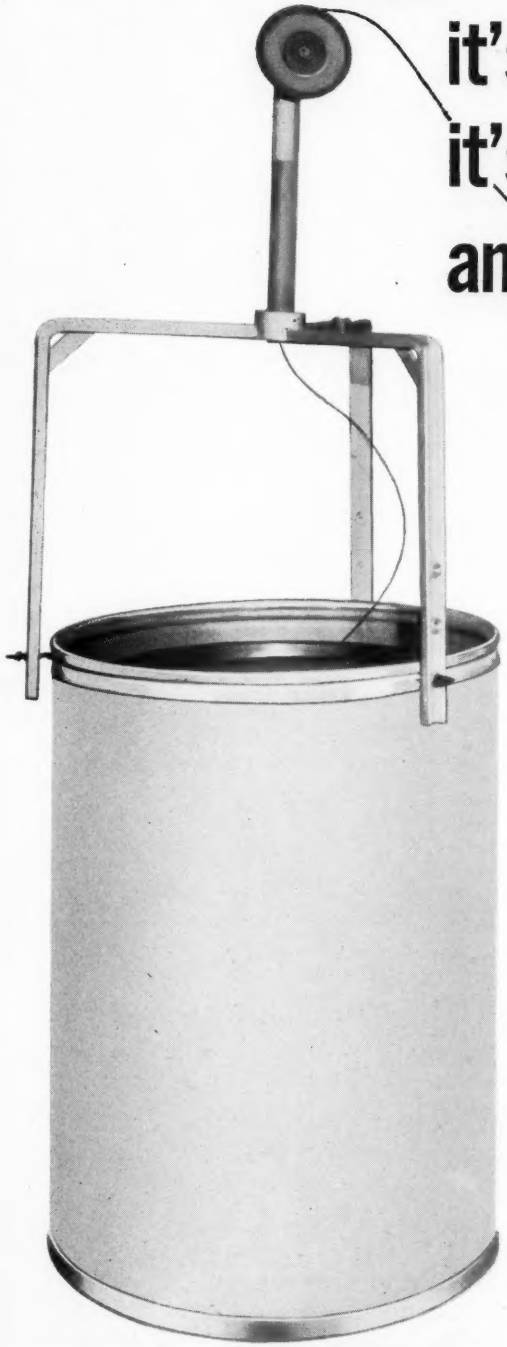


On this newly installed patenting furnace steel rods are heated, then quenched in a bath of molten lead, giving the steel a uniform fine-grain structure for further processing into wire. * * * * * * * *

On the shipping floor bundles containing millions of feet of wire in various sizes and grades, await shipment. Speed of delivery has become a highly developed service under the spur of competition. * * * * * * *

Payoffpak...

it's new...it's different... it's ideal for handling and processing WIRE!



PAYOFFPAK—Continental's newest fibre container—offers wire manufacturers and fabricators a revolutionary new development in wire packaging, handling and dispensing.

SAVES WORK—Wire is automatically packaged in the Payoffpak as it is drawn, eliminating such operations as stripping, tying, handling, splitting and wrapping.

SAVES TIME—Payoffpak can hold 600 lbs. Downtime on the wire drawing machine, due to stripping operations, is greatly reduced.

ELIMINATES REELS—Single standard-size Payoffpak eliminates reels and need for wide range of block sizes.

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A survey indicates that often more than 50 labor steps are needed to convert 500 pounds of steel wire in standard eight inch coils—but you can do the same job with Payoffpaks in an average of five operations. No wonder they are calling this new container "the long-playing record of the wire industry" See how Payoffpaks can pay off for you. Call Continental for complete information on this exciting new way to package, handle and dispense wire.

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Solution Heat Treating, Annealing and Strain Relieving in One Salt Bath Furnace

by
T. H. Atkinson
General Maintenance Supervisor
and
W. Paul Thompson
Director of Quality Control
Townsend Company
New Brighton, Pennsylvania

In this article a fastener manufacturer describes the versatility of the salt bath furnace in the production of cold-headed products.

About 60 million pieces a day is the capacity of the world's largest manufacturer of rivets—the Townsend Company in New Brighton, Pennsylvania. These multi-million pieces include not only all types of solid and tubular rivets, but also a multitude of other fastening items such as nails, screws, studs, and small parts which we call gadgets. While the almost incredible production capacity naturally indicates that the Townsend Company is a mass-producer, many of these products are components for intricate machines and devices with closely controlled tolerances.

★ ★ ★

Specialists in cold heading operations, our 138-year-old Company—second oldest industry in Pennsylvania—uses both steel and nonferrous rod as raw material from which wire is drawn for use in a large variety of cold heading, extruding and forming machines. Items formed in these machines may be processed further by bending, threading, knurling, drilling, slotting, pointing, and other supplemental operations. Parts are then plated, coated or finished as required to protect the metal from corrosion, to resist acid, to improve its electrical conductivity, etc.

Three for One

With such great diversification of product, equipment that can handle one or more operations or types of products is extremely valuable. In one instance, a piece of heat treating equipment that was originally purchased for one operation proved so effective and versatile, that now three entirely different operations (solution heat treating of aluminum alloys, annealing of brass and copper, and strain relieving of steel) are conducted in the same furnace.

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Prior to the installation of this furnace, a gas-fired box-type furnace was used for the solution heat treatment of aluminum alloys that eventually became rivets, nails, screws, and the like. However, larger capacity was needed as it was not possible to process large coils of wire. Therefore, the purchase of new equipment was dictated in order to step-up production—shorten time cycles, and to overcome certain shortcomings in the old equipment.

First Aluminum Alloy Wire

Original furnace design required that coils of 17-S, 53-S, 61-S, and A-17-S aluminum alloys receive a solution heat treatment at 950°F. After investigating several processing methods, an Ajax electric salt bath furnace, produced by the **Ajax Electric Company,** Philadelphia, was purchased and installed in January 1953. It was felt that the advantages of salt bath heating such as high heating rates, protection against oxidation, and uniformity of bath temperature were sufficient to warrant its selection over air furnaces.

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This 130 kw unit, with bath working dimensions 4 feet long by 4 feet wide and 46 inches salt depth is currently employed to heat treat the above mentioned grades of aluminum alloys at the rate of approximately 1,000 pounds per hour. Actual time-temperature cycle used is 30 minutes at 950°F. A typical charge, illustrated in Figure 1, comprises six 90-pound coils of aluminum alloy wire. Following immersion in the nitrate bath, the coils are quenched in hot water for 5-10 seconds and then given a cold water wash.

Two Other Applications

The second application of this three-purpose salt bath is the annealing of brass and copper wire. Brass wire, 65-35 grade, in sizes from 1/16" to 3/8" diameter, and electrolytic tough pitch copper wire (99.9% copper) in the same sizes as the brass wire, are annealed in the Ajax salt bath furnace. The time-temperature cycle for a charge of either brass or copper wire is approximately 30 minutes at 1000°F. Again, a hot

Unsurpassed-anywhere!

IT ALL COMES DOWN to one fact... that you can always count on Roebling high carbon flat spring steel to reduce preparation time, machine stoppages and rejects to a minimum. What's more, it's made as you want it... annealed, hard rolled untempered; scaleless tempered; tempered and polished, blued or strawed.

You *pay* for the best every time you buy flat spring steel. Make sure you *get* it. Specify Roebling. John A. Roebling's Sons Corporation, Trenton 2, N. J.

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The Silver Anniversary

CONVENTION OF THE WIRE ASSOCIATION!

— Be Sure to Attend —

November 8-11, 1954, Statler Hotel, Detroit, Mich.

It will mark an important milestone in the history of the Association, with appropriate features for the occasion. There will be a technical program of exceptional calibre, with all of the regular features, plus some new ones. Something different and refreshing in plant visits is also scheduled—a morning tour of the Carboloy plant, with luncheon there, and an afternoon trip to a large user of wire—the Ford Motor Company of Dearborn, Michigan.

The registration fee for members will be $11.00, which includes the Annual Luncheon at 1:00 P.M. on Wednesday.

The registration fee for non-members will be $13.00, which also includes the Annual Luncheon—a festive affair!

Note that this year there is a difference of $2.00 between the cost of registration for members and guests.

Company Memberships entitle all employees of the company to register on a Membership basis.

Members will have blue badges and guests will wear red badges.

Ladies are cordially invited to attend the Annual Luncheon, for which tickets at $5.00 each will be available. No registration needed.

EVERYBODY OUT FOR DETROIT IN 1954!

Make your reservations early to be sure of good accommodations. Hotel reservation cards will be mailed to members of the Association. However all wire men are invited to attend and non-members and guests will be sent reservation cards upon request.

THE WIRE ASSOCIATION

RICHARD E. BROWN, Executive Secretary

453 MAIN STREET **STAMFORD, CONN.**

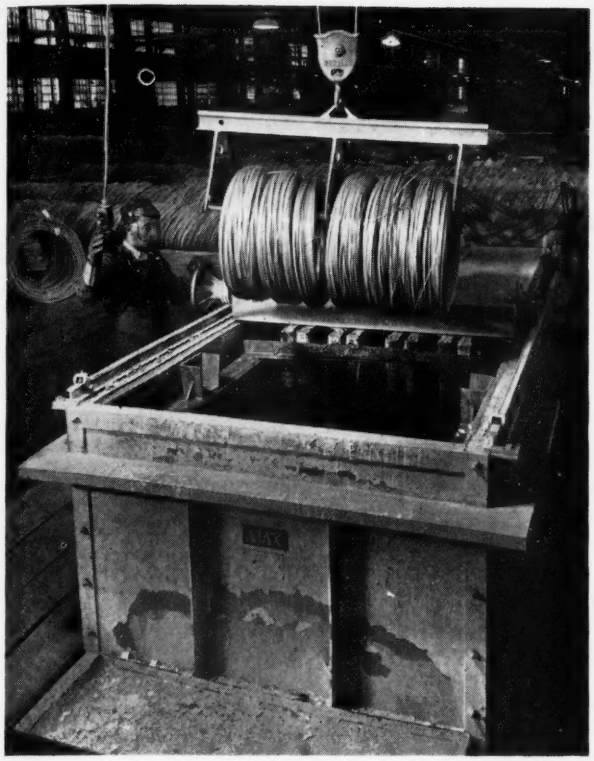

Figure 1 A 500-pound charge of 61-S aluminum alloy wire is being lowered into the Ajax electric salt bath furnace.

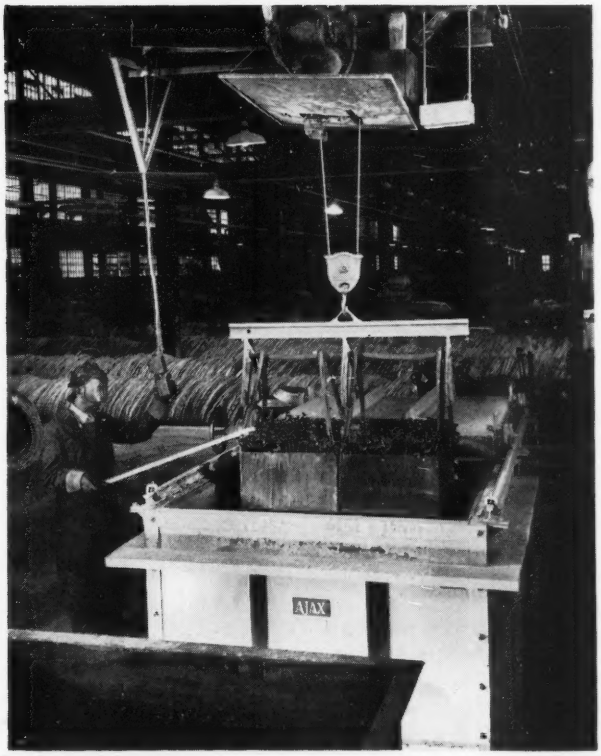

Figure 2 A 500-pound charge of C 1008 steel parts that have been cold headed, going in to the same Ajax furnace for strain relieving. Processing temperature here (1050°F) is 100°F higher than for solution heat treatment of aluminum wire.

water quench and cold water wash complete the cycle.

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Undoubtedly the most unusual application of the nitrate salt bath furnace is the strain relieving of C 1008 ½ inch steel rods which have been cold headed. As shown in Figure 2, these long washing-machine parts, weighing about a pound each, are racked in two baskets (250 pieces/basket) and immersed for 20 minutes in the bath which is controlled at 1050°F. A hot water quench completes the strain relief operation. Although this particular operation is performed intermittently, actual records covering several month's time show an average production of 5,000 lbs. of steel parts for an 8-hour shift. Production of this one item actually jumped up 400%.

Never Even Sludged

In addition to the unique and outstanding benefit of performing three different operations in one furnace, the Ajax unit also has other distinct and specific advantages. In the past, other pieces of equipment that consumed large quantities of power had lowered the plant power factor, but this 130 kw furnace has increased and stabilized the power factor.

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Total absence of any maintenance costs with the furnace after over a year's operation is yet another basic benefit. For example, transformers, electrodes, and the welded steel pot which contains the molten salt actually show zero maintenance costs. In fact, desludging has never been necessary. Adding up the benefits of versatility, increased production and minimum maintenance makes this furnace one of the most effective pieces of equipment in the mill.

NOW IS A GOOD TIME TO JOIN

THE WIRE ASSOCIATION

All persons engaged in the production of wire, wire products and electric wire and cable should be members and participate in its good work.

Send for application blank and booklet today.

RICHARD E. BROWN, *Executive Secretary*

453 MAIN STREET **STAMFORD, CONN.**

A Practical Analysis of the Causes of Die-Wear in the Dry-Drawing of Ferrous Wires

by E. P. Riley-Gledhill, Esq.
Standard Wire Company, Ltd.
Sowerby Bridge, England

This paper presented by the author on March 24, 1954, before a session of the Staff School of the Caledonia Works of Frederick Smith & Co., Ltd., Halifax, England, received the Second Award in the Technical Section of the Staff School's Open Awards. It is published through the courtesy of Frederick Smith and Company, Ltd.

1. **One** frequently reads in the trade journals articles devoted to those processes which are closely related to wiredrawing—Patenting, Annealing, Cleaning and Coating, Galvanising, Tinning, Die Servicing etc.; rather less appears to have been published on the practical aspects of **drawing** ferrous wires and the many problems which are encountered in that operation. The wiredrawer has, nevertheless, been faced with a diversity of problems right down through the ages since wire was first drawn.

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2. **Until** the advent of steam power the greatest problem affecting wiredrawing was probably that of supplying the necessary motive power to draw the wire through the die, even though up to that time only very short lengths of wire were drawn. Following upon the introduction of steam power came mechanical developments which made possible the rolling of wire rods in coils of up to about 1 cwt. In order to draw these larger rod coils the wiredrawer required improved machinery and without doubt found that he also needed better dies, or plates as they were then known.

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3. **Up** to the early part of the 20th Century steel wire was drawn almost exclusively on single hole bench blocks—a method which ultimately became both cumbersome and inadequate for supplying the ever increasing demand for wire. The more progressive manufacturers began to experiment with multi-hole machines, drawing speeds were increased, and the efficiency of those machines was enhanced by the supply of rods in coils of some 400 lbs from new Rod Mills. Unfortunately the performance of the steel dies used at that time often restricted the benefits which could otherwise have been derived from the improved machines and heavier coils of rods; and die wear became the outstanding problem of the day. In order to raise the standard of die performance improved die steels were produced and trials were made with different methods of setting the dies; despite these changes, and the almost universal use of sull coating, die wear remained a serious problem.

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4. **Around** 1930 the Tungsten Carbide die made its appearance and the non-slip accumulative type of machine began to replace the wire drawing bench and the fixed capstan type of machine; the continuous feeding of the machines was made possible by the introduction of the electric butt welder. The die boxes of the non-slip machines were designed to permit water cooling of the dies, and water cooling of the blocks soon followed. The water cooling of the dies and blocks was made necessary by the greater heat generation caused by the increased drawing speeds and by the rapidity with which one drawing pass was followed by the next in the continuous drawing. This cooling was found to improve the quality of the drawn wire, particularly the torsional properties of patented steel wire. Up to the present time the non-slip accumulative type of machine has been widely adopted by British wire mills for the dry drawing of ferrous wires. Despite these improvements in equipment, die wear remains the major problem in the drawing of all Ferrous wires.

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5. **Before** examining the possible causes of die wear let us examine the practical setup which exists today in most wire mills.

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6. **The** wire rods as received from the rolling mill have on their surface a layer of scale which is formed during the cooling of the rod after rolling; patented rods are also to greater or lesser degree scale covered. Before drawing can be undertaken the scale must be completely removed, the most common method being acid pickling followed by a thorough water swill to remove any acid, iron salts or loosened scale which may adhere to the surface of the rods. When a drawing coat is required on the rods Ferric Hydroxide is formed by subjecting them to prolonged spraying with water or, alternatively, a phosphate coating is applied by dipping them in a phosphate solution. Hot liming of the coated or uncoated rods then follows, with a final baking in a hot oven to complete the process. After this preparation by the cleaners the rods are drawn on machines operated by wiredrawers, the material being drawn through tungsten carbide dies which are serviced by die polishers.

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7. **Prior** to the use of tungsten carbide dies the wiredrawer pre-

pared his own steel dies or plates and consequently when experiencing excessive die wear he had often to find his own remedy; when drawing troubles arise under present-day conditions he is not so seriously perturbed, it is partly the die polisher's worry and the wiredrawer draws another die or batch of dies from stock. In many cases the drawing trouble is repeated and dies are changed until the stock of the particular size of die is exhausted, when production finally comes to a stop. The loss of output due to the machine being repeatedly stopped for die changes is even more serious than the expensive waste of dies which results from such a practice.

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8. **Of** the various means used in attempting to overcome these difficulties the one most commonly investigated is the drawing coat—Sull coat or Zinc Phosphate. The latter type is considered to be superior to sull coating. But are these coatings really necessary, and, if so, what is their function? It may be that there is some advantage in certain very difficult cases, such as the drawing of very high carbon steels at high speeds. Generally speaking, however, it is the Author's considered opinion that the value of these coatings is very much over-rated, and that in most cases their use achieves nothing more than to help cover up faults which exist on the wiredrawing machines. When excessive die wear is experienced in drawing a particular grade of material it would seem almost general practice to attempt to reduce the die wear by improving the coating.

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9. **The** function of these special coatings is to act as a soap carrier and to help to form a cushioning film or skin between the wire surface and the die wall; the film being of sufficient strength to withstand the pressures and stresses exerted by the wire on the die face during drawing, so preventing a metal to metal contact which would result in the seizing of the wire in the die. Should a breakdown of the film or drawing skin occur the resultant seizing of the wire causes the die to "pick up" metal and then the wire scrapes out of size; this, it is submitted, is the most common source of trouble experienced when drawing ferrous wires. In order to assess the validity of the theory it is necessary to study the factors involved in the drawing operation.

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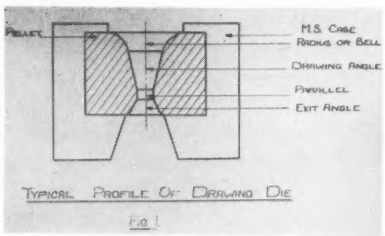
10. **Only** steel which is ductile can be drawn into wire—this condition of plastic flow is exploited by pulling the wire through a die which has a conical hole. It is apparent that the actual shape of this conical hole must be such as to induce plastic flow. Fig. 1 shows the usual profile of a tungsten carbide die.



11. **The** included angle of the drawing zone usually ranges from 8° to 16° according to the class of work to be performed. The fact that no standard angle is universally used shows that the exact angle of the drawing zone is not vital and yet for each different class of work there must be one particular shape which is most successful. This will depend upon:—

(a) The size of the die bore.
(b) The percentage reduction in area to be affected.
(c) The degree of hardness of the wire being drawn.

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As the production of most mills includes wires of many qualities and carbon ranges, there must of necessity be some compromise on this point in order to avoid the carrying of stocks of dies in an impossibly wide range of angles.

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12. **In** the Author's experience it has been found that dies with an included drawing angle of 14° give very good results when used for roughing the rolled rod. As the wire is drawn smaller and consequently becomes harder a narrower angle is required in order to effect a more gradual reduction of the steel. The following angles have proved to be most satisfactory:—12° for sizes .160″ to .128″, 11° for sizes .128″ to .090″, 10° for sizes finer than .090″ and 8° dies have been used successfully in some instances. In all cases a clearance angle of 12° is used; this being approximately one third of the length of the drawing angle. The length of parallel, which generally is not a true parallel, is approximately 50% of the bore size.

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13. **The** range of sizes for each drawing angle is not rigid—some overlapping may be practised without detriment to the results. The length of the exit angle is important; too short an exit angle must be avoided for with dies having little or no exit angle the pressures exerted in the die during drawing are concentrated too near the exit face, with the result that fracturing of the die is liable to occur. With a clearance angle of approximately one third of the length of drawing angle, these pressures are more centralized in the die and so fracture of the dies through this cause is largely eliminated.

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14. **The** presence of drawing pressures, which vary according to the type of steel being drawn and are effected by the contour of the die, must at all times be considered by those concerned with the drawing of wire. In order to reduce the friction resulting from these pressures, soaps are generally used as the lubricating medium; the fat content and melting point of these soaps are variable and consequently have varying effects on die wear.

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15. **The** requirements for drawing wire from steel rods on continuous machines are therefore seen to be:—

(a) A perfectly clean rod surface with or without some coating medium applied.
(b) Tungsten carbide dies of appropriate shape.
(c) Suitable lubricants.
(d) Efficient cooling of the dies and wire.

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16. **It** has been shown that all these factors can be variable and

as the wiredrawing machines—although basically the same—are made by various manufacturers, all have special features which must be taken into consideration.

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17. **The** one constant factor is the actual cause of die wear during drawing; this undoubtedly arises from the pressure exerted by the wire on the die face. The pressure appears to be greatest at the point of contact where drawing rings are formed in the dies. Drawing rings appear to be created by the breaking away of small particles of tungsten carbide, caused by the digging-in effect of the wire at the point of contact. The rate of wear and the consequent life of the die is dependent upon the amount of friction developed within it by the drawing pressure.

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18. **The** presence of a lubricant between the wire and the die partially helps to overcome frictional resistance and thus reduces the rate of die wear. The quality of the tungsten carbide also has its effect on die life. A carbide having a high cobalt content will naturally be of a soft nature and so will have a low resistance to wear. On the other hand a die having a low cobalt content will be very hard and more resistant to wear, but unfortunately tends also to be brittle and prone to crack if subjected to thermal or mechanical shock. Tungsten carbide dies containing approximately 8% cobalt have been found to give very satisfactory results.

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19. **Excessive** die wear is a constantly occurring trouble in most wire mills, the magnitude varying to some extent with the class of wire being drawn; the harder the metal being drawn and the more prevalent is the occurrence. When excessive die wear is experienced it is usually found to take place very early in the die's life, whether or not the die be in the new or reconditioned state. The wear is usually demonstrated by the breaking down of the skin of lubricant on the wire, resulting in a very high shine appearing on one particular side of the wire—on the opposite side the skin remains dull and intact. If drawing is allowed to continue this shine rapidly becomes a series of longitudinal lines commonly known as scraping and ovality of the wire often follows.

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20. **If,** as soon as this scraping becomes apparent, the die concerned is removed from the machine and is cleaned and examined, it will invariably be found that the ringing of the die is most pronounced; the ring frequently occurs in only one section of the die, and is usually of greatest depth towards the centre of that section. From this wear ring to the exit end of the parallel, small particles of metal may be seen to have attached themselves to the die face. These particles of metal, commonly known as "pick up", are responsible for the rupture of the skin on the wire which in turn leads to the scraping.

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21. **What** causes this "pick up" of metal? It is considered that this is due to the failure of the lubricant to withstand the pressures and temperature within the die, coupled with the inability of the die itself to withstand the heavy pressure exerted at the point of contact.

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22. **When** a ring forms rapidly in a die the particles of carbide which are removed are forced through the die in such quantity that they cannot all be absorbed by the soap skin on the wire. The excess particles become attached to the surface of the die, immediately rupturing the drawing skin of the wire and causing it to seize; particles of the wire are then torn away from the wire surface, mix with the carbide particles and thus build up in the die, causing a complete breakdown of the lubrication. Drawing pressure within the die increases, with a consequent rapid rise of temperature; this may result in a portion of the die, corresponding to the section where the build-up occurred, being torn away or—even more serious—fracture of the die at right angles to the direction of drawing, caused by thermal shock.

23. **In** order to avoid this excessive die-wear many manufacturers attempt to increase the amount of sull coat on the wire by spraying for longer periods, whilst others are using improved coatings such as zinc phosphate. It is claimed that by the use of a phosphate coat die life may be doubled and even trebled, but what does this amount to if the initial die life was very low?

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24. **What** is the claim made for such a coating? One may be told that it enables the wire to pick up more soap in the drawing operation—surely this is a most expensive method. Whilst having no practical experience of phosphate coating, the Author suggests that this, by existing on the clean surface of the rod in a chemically attached layer, prevents the metal to metal contact which occurs whenever the normal lime-soap skin breaks down, and so avoids seizing and scraping of the wire. How long a phosphate type of coating will stand up to such conditions will no doubt depend upon the amount of coating applied—a factor which also affects the cost of application per ton. With an average cost of applying a phosphate coat in the region of 15/—per ton of rod cleaned, a firm processing only 100 tons of rod per week will have an extra operational cost of some £3,500 per year.

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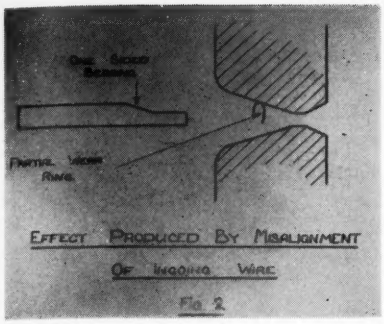
25. **Having** reviewed the actual sequence of events within the die when excessive wear takes place, and the methods which are generally adopted to remedy the trouble, it would now seem appropriate to outline what, it is submitted, is the actual cause of this wear. When excessive die wear is occurring on a machine, examination of the die will reveal a partial ringing and all subsequent replacement dies will show the same characteristic; if with the die in the machine the wire is pulled back, the bearing, which is the impression formed on the wire in the reducing zone of the die, will be found to be all on one side (Fig. 2). This will conform with that part of the die which has a partial ring, and the remaining part of the die



which is not ringed will conform to the side of the wire showing no bearing. This condition is caused by misalignment of the ingoing wire. It is obvious that the reduction of the wire is taking place on approximately half of the available surface of the die and that part of the die is consequently being subjected to at least double the necessary work or pressure.

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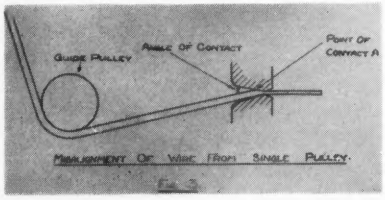
26. **In** practice, misalignment is usually caused by the wire running in the form of a curve between the die box pulley and the die, thus causing a digging-in effect as illustrated at point A in Fig. 3. The greater is the angle of contact at point A the more pronounced will



be the ringing. The curving of the ingoing wire is no doubt caused to a large extent by the "cast" of the wire; this becomes more apparent as the wire is drawn further and becomes harder through work hardening, e.g. if drawing six holes from the rod the wire is usually more closely cast to the block curve on the fourth, fifth and sixth holes than on the earlier ones, and it is usually on the last few holes that the heaviest die wear takes place.

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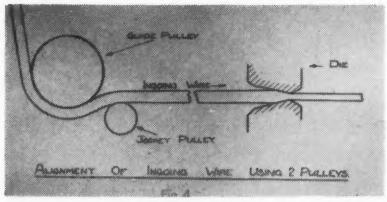
27. **Practical** experience of the result of correcting misalignment has been obtained on non-slip accumulative type of rod machines, as supplied by three British makers; these originally had only one guide pulley fitted to direct the wire through the soap box into the die. On one make the pulleys were rigidly fixed to their respective soap boxes, thus making adjustment impossible. On the other makes of machines the pulleys were adjustable. At that time all rods were heavily sull coated and yet when drawing mild steel four holes to 13½ S.W.G., excessive die wear was often encountered. It was noticed that the scraping of the wire always occurred on the same side, usually towards the top of the die. Misalignment of the ingoing wire was suspected to be the cause and many attempts were made to correct this on the machines with adjustable pulleys; ultimately the conclusion was reached that on this type of machine it was almost impossible to obtain perfect alignment of the ingoing wire with the aid of only one guide pulley. An additional smaller pulley was therefore fitted between the original guide pulley and the soap box. This smaller pulley was also made adjustable vertically (Fig. 4).



28. **This** arrangement made it possible to break the curve or cast in the wire. It was found that by careful adjustment of the pulleys almost perfect alignment of the ingoing wire could be obtained. The adjustment of the second pulley is always required to be in the direction of the die wear section, i.e. if the wire is scraping at the top the pulley will require raising. The amount of adjustment required is assessed by examination of the bearing formed on the wire. Correct adjustment results in a uniform bearing on the wire with less risk of the soap skin being impaired. As a final check, the dies, after completing a run, are marked prior to being removed from the die boxes and the wear ring is checked for uniformity. Should any irregularity be found in the ring there follows a final adjustment of the pulleys.

29. **Tungsten** carbide dies used as guides have proved even more effective than the small pulleys. Each guide-die is mounted in a suitable holder which has four way adjustment; these have been found to facilitate the quick and accurate alignment of the wire. Naturally the bore size of the guide die must be considerably larger than the wire being drawn. Cracked dies without sharp edges are used and the rubbing of the wire on these dies has no adverse effect on the drawing skin. Once the guide dies are set to give perfect alignment of the ingoing wire it is not necessary to readjust them, other than in exceptional cases; e.g. if a machine previously finishing at sizes 9 to 12 S.W.G. is changed over to drawing 15 or 16 S.W.G. some slight adjustment will be necessary.

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30. **Perfect** alignment of the ingoing wire and efficient lubrication have been proved to be the most effective remedy for excessive die wear, with the result that we have been able to eliminate the cleaning house coating of the material. The rods are simply cleaned in Hydrochloric acid, thoroughly hosed, dipped in hot lime and baked; efficient cleaning is vital and any rods delivered to the mill with scale on them are returned for further cleaning. As this adversely affects the cleaner's earnings it is seldom that a batch requires to be returned. A good quality Buxton Hydrated lime of a not too thick consistency is used; inferior quality lime should be avoided as it may contain a fairly high proportion of sand and gritty matter which would produce an abrasive action in the roughing dies.

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31. **On** entering the drawing mill from the cleaning yard baker, the rods have a clean surface beneath the coat of lime which prevented the formation of rust in the baking operation. The material may range from mild steel containing 0.08% Carbon to Patented steel of 0.75% Carbon, for drawing to wire ranging in tensile from 30 to 120 tons/sq. in.; all are given the same surface treatment.

32. **As** we are drawing uncoated wire we must rely on the formation of a lime-soap skin at the roughing pass to prevent metal to metal contact in the die. It is therefore necessary that as much soap as possible be applied to the wire in the roughing pass. This is achieved by pressure lubrication; the rod passes through a tube of suitable dimensions situated inside the soap box—the tube having a tapered end which fits tightly into the die locking nut. With this method a very heavy soap skin is formed on the wire, so much so that it is unnecessary to provide soap for the following two passes as there usually occurs a build up of soap from the wire in the second and third soap boxes. The following boxes require the addition of soap at intervals. Pressure lubrication is only applied to the roughing box, in succeeding boxes the wire runs freely through the soap powder.

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33. **Using** a suitable soap for the class of work in hand, this method of lubrication, in conjunction with perfect alignment of the ingoing wire provides almost perfect drawing conditions. In the initial experiments greatly improved die life was obtained with, of course, better machine efficiency and a higher output. At that stage a normal type of brown sodium-base soap powder was used for all grades of wire; it was found that when drawing Patented steel wire die life was still not very high as compared with mild steel, the lime-soap skin tended to break down after drawing a few tons—usually at the fourth or fifth pass. This was attributed to the lubricant becoming too fluid in the actual reducing zone of the die.

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34. **About** three years ago experiments were made with a lime-base soap which had a much higher melting point than the sodium-base soap powder, and it proved to be ideal for our rod machines when drawing 0.55% C. to 0.75% C. Steel. The soap skin which is formed on the wire at the first die appears to be less heavy than is obtained with ordinary soap powder but this is more than compensated for by the heavy tube of partially burnt soap which comes through the die with the wire. There is no loss of skin on succeeding holes and at each stage there is the characteristic free carry-through of the partially burnt soap. This type of lubricant gives complete protection against metal to metal contact and over a period of years drawing under these conditions only rare cases of scraped or burst dies have been experienced; on those occasions the trouble has usually been caused by badly cleaned material. A further advantage is that wire drawn with lime-base soap may subsequently be Electro-Galvanised without being degreased.

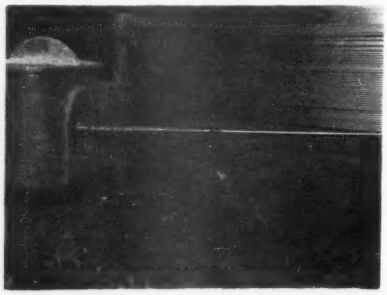

Fig. 4A

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35. **Previous** to using this type of lubricant we were troubled with many dies breaking transversely in the actual drawing zone. It is reasonable to presume that most of these breakages were caused by thermal shock, resulting from a sudden increase in temperatures within the die when the drawing skin failed and metal to metal contact occurred. Table 1 shows typical results of die life obtained when drawing uncoated 0.60% C. Patented steel rods.

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36. **It** will be seen that three different finished sizes were drawn, the third and fourth holes being changed for drafting purposes. The first and second hole dies were never removed from the machine and the tonnages shown against them represent a continuous run. The tonnages shown against the finishing dies do not represent continuous runs, but were drawn in separate runs of approximately 2 to 10 tons. Each .076″ die was removed from the machine when worn out .001″, and the two dies .091″ and .079″ were suitable for further use when required. Generally speaking, dies used in continuous runs may be expected to produce greater tonnages than if frequently changed for short runs.

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37. **For** the purpose of this paper a trial was made with a new set of dies for drawing 5 holes 14½ S.W.G. ex 5 S.W.G. 0.60% C. Patented Steel Rod, using sodium-base soap powder. Due to the failure of the drawing skin the fourth and fifth dies required changing after drawing 47 cwts.; the fourth die was found to be fractured transversely. The lubricant was changed to lime-base soap throughout the machine and new dies were fitted at the fourth and fifth holes. At the time of writing the fourth hole die has drawn 44½ tons; the fifth hole die drew 20½ tons before wearing .001″ over size and the replacement die has drawn 24 tons to date. These results show conclusively that, if maximum die

TABLE 1.

	1st Die	2nd Die	3rd Die	4th Die	5th Die	Tonnage Drawn	Condition of Finishing Die
5 Holes.076"	.172"	.140"	.1125"	.091"	.076"	24 tons	Worn .001" Changed
5 Holes.076"	"	"	"	"	.076"	30 tons	Worn .001" Changed
5 Holes.076"	"	"	"	"	.076"	26 tons	Worn .001" Changed
5 Holes.091"	"	"	.118"	.105"	.091"	19 tons	Available for further service
5 Holes.079"	"	"	.1125"	.0975"	.079"	11 tons	Available for further service

OUTPUT OF DIES DRAWING 0.60% CARBON PATENT STEEL (5G ROD).
CONDITION - UNCOATED FINISHING SPEED 452ft/min.

life and spindle efficiency are to be obtained, the use of correct lubricants for the particular grade of steel being drawn is most important, even when operating under ideal drawing conditions.

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38. **Excessive** die wear has been encountered when drawing .28/.33% Carbon, 1.00% Manganese 5 S.W.G. Rod, 8 holes to 18 S.W.G. In this case the rods are first drawn 3 holes to 11 S.W.G. on a 3 hole Rod machine, followed by 5 hole drawing on a separate machine finishing at 720 feet per minute. This material is also drawn in an uncoated condition. Whilst using a sodium-base soap powder as the lubricant the die life varied considerably, some runs being quite good but others being very much the opposite. The lime-base soap has not enabled improved results to be obtained in the second stage of drawing, probably due to its coarse particle size. Experiments have recently been carried out using lime-base soap on the rod machine (3 holes) and Calcium Stearate on the last five holes. Although Calcium Stearate is comparatively expensive its use has been thoroughly justified by the results so far obtained. Excessive die wear caused by drawing skin failure has been largely eliminated, with resultant savings in dies and increased spindle efficiency. Some typical results are shown in Table 2.

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39. **The** results shown in Tables 1 and 2, may not appear very high when compared with results obtained when drawing Mild Steel; in view of the much lower pressures and temperatures within the die when drawing mild steel, die wear should certainly be less severe. Mild steel can, however, cause excessive die wear when drawn in the hard condition (ex rod) to sizes 16 to 20 S.W.G. Some typical die life figures for mild steel are shown in Table 3.

TABLE 2.

Lubricant - Sodium Base Soap Powder

	1st Die	2nd Die	3rd Die	4th Die	5th Die	Tonnage Drawn	Condition
Set "A"	.096"	.079"	.065"	.054"	.046"	7¾ tons	
Set "B"	.097"	.0795"	.065"	.054"	.047" .047"	½ ton 1¼ tons	.047 scraped. .054 & .047 scraped
Set "C"	.0965"	.0795"	.066"	.055"	.047" .047"	2½ tons 3 tons	.047 scraped. .055 & .047 scraped
Lubricant changed to Calcium Stearate							
Set "D"	.0965"	.0795"	.066"	.0545"	.046"	7½ tons	
Set "E"	.096"	.079"	.066"	.054"	.0465"	6 tons	Dies scraped by scaly material.
Set "F"	.096"	.0795"	.0668"	.055"	.0465"	11½ tons	Dies still in service

OUTPUT OF DIES DRAWING 5 HOLES .046"/.048" ex 11G HARD DRAWN.
11G DRAWN 3 HOLES EX 5G ROD .28/.33% CARBON 1.00% MANGANESE.
CONDITION - UNCOATED FINISHING SPEED 720 ft/min.

40. We produce a considerable tonnage of 2 holes 10 S.W.G. Square wire ex 5 S.W.G. Mild steel rod. This is drawn on single hole blocks and the round rod is reduced to a semi-square section at the first pass. In order to obtain good die life and maximum efficiency it is essential that perfect alignment of the ingoing wire be maintained. Failure to do so usually causes the wire to be reduced on only two or three of the four die faces, due to the wire not completely filling the die; ringing of the die rapidly ensues, followed by a breakdown of the drawing skin and scraping of the wire. After service at 10 S.W.G. Square (with tolerance + or — .003") the dies are made into first hole semi-square roughing dies. Table 4 shows tonnages obtained when drawing this class of wire.

Conclusions

41. **Drawing** tests have proved that, given proper attention to matters of material cleaning, die shapes, lubrication and cooling, excessive die wear may be eliminated through the correct alignment of ingoing wire and dies, and the additional expense of applying draw-

(*Please turn to page* 767)

TABLE 3.

Draft	1st Die	2nd Die	3rd Die	4th Die	Tonnage Drawn	Finishing Die Worn	Finishing Speed FT/MIN.
3 Holes .110 ex 5G.S.M.	.167"	.136"	.110"		134 tons	.002"	415
3 Holes .127" ex 5G.S.M.	.180"	151"	127"		156.5 tons	.001"	415
4 Holes .060" ex 10G Hard	.107"	.086"	.071"	.060"	28 tons	.002"	476
(10G drawn 3 holes ex 5G S.M.).	.108"	.0875	.072"	.060"	27.5 tons	.002"	476
4 Holes .086 ex 5G S.M.	.167"	.132"	.108"	.086"	74 tons	.001"	476

OUTPUT OF DIES DRAWING .08/.12% CARBON M.S.

CONDITION - UNCOATED.

Determination of Correct Wire Tensions

by Dr. Erwin J. Saxl
Tensitron, Inc.
Harvard, Massachusetts

In this article the author, well-known as the manufacturer of tension motors and testing equipment for precision wire work, shows the effect of correct tensions and provides a table of safe operating tensions for any particular operating condition.

In a previous paper we have already discussed the Setting of Wire Tensions with Tension Meters.*

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Knowing then that they can be measured, what are the proper tensions with which we should work? This is a question that is at the root of many production problems in wire processing, particularly with fine wire wound products. The questions are: At what tensions can fine copper wires be safely produced? What is the correct tension for coil winding? What tension should be used in wire drawing?

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The wires during their processing, such as drawing, tinning, coating, and insulating, should not be stretched beyond their danger point. This paper shows a method for defining in a simple manner the critical limit for tensions. Below it, the load-extension characteristics take place within which Hooke's law is valid. That is to say, stress is essentially linearly proportionate to strain.

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However, when the point is reached where the elastic recovery of the wire ceases, there will be a condition of serious deformation. It is up to the production supervisor to choose the tensions in such a manner that the wire is run with the proper tension.

* "Setting Wire Tensions with Tension Meters" by Dr. Erwin J. Saxl—Wire & Wire Products—June, 1952.

In these days of severely limited tolerances in many specifications, this is important from the viewpoint of smooth operating conditions with a minimum of breakage. Particularly, if it is required to maintain a tolerance of .0001" for the wire diameter, close engineering supervision and maintenance of proper tensions is of the essence.

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It is significant that the critical changes in tensile characteristics take place long before the ultimate breaking strength has been reached. In other words, it is necessary to engineer the tensions for controlled deformation, not for ultimate break.

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The following is a practical attempt to arrive at a load that should be considered proper in most instances. Since ultimate breaking load is of little significance, we introduce here for the first time a practicable concept of Safe Operating Tensions (S.O.T.)

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Let us assume that a load of 15,000 pounds per square inch is correct for the processing of the finer sizes of copper wires. (This is only about 10%—15% of the 100,000 — 150,000 pounds per square inch commonly considered as ultimate breaking strength for copper.)

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Actually this figure of 100,000—150,000 pounds maximum tension varies according to the type of dies, the number of drafts, the hardness of the wire, the temperature of processing, annealing and also other factors. Thus while the engineer in charge may arrive at limits for his operational tensions in processing copper wire that differ somewhat from our table, a start is made here in the right direction, from which the limits of tensional tolerance may be derived by conforming to the operational requirements of different wire processing schedules and the operating schedules of different wire drawing departments.

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Based upon this premise, we have calculated and show in Table I the values that constitute the safe tensions for the standard types of copper wires according to their sizes and cross-sectional areas.

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To show how these values were determined we give in the following some calculations in detail for the conversion factors: (See Tab. I)

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Since #34 wire has a diameter of .0063 inches, its cross-sectional

Table (1) Safe Operating Tensions for Standard Annealed Copper Wires

Conductor size American Wire Gage (Brown & Sharpe)	Diameter in inches at 20° C	Cross-sectional area in square inches at 20° C	Safe Operating Tension to the nearest gram at 20° C
27	.01420	.0001583	1,079
28	.01264	.00.1255	855
29	.01126	.00009954	678
30	.01003	.00007894	537
31	.008928	.00006260	426
32	.007950	.00004964	338
33	.007080	.00003937	268
34	.006395	.00003122	213
35	.005615	.00002476	169
36	.005000	.00001963	134
37	.004.53	.00001557	106
38	.003965	.00001235	84
39	.003531	.000009793	67
40	.003145	.000007766	53
41	.002800	.000006159	42
42	.002494	.000004884	33
43	.002221	.000003873	26
44	.001978	.000003072	21
45	.001761	.000002436	17
46	.001568	.000001932	13

area (a) amounts to 31.22 x 10^{-6} square inches.

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Multiplying the above cross-sectional area (a) with the S.O.T. factor of 15,000 pounds per square inch we then arrive at 15,000 x 31.22 x 10^{-6} = .47 pounds, which gives 213 grams of safe operating tension for #34 wire.

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Fine wires may be defined as those that have essentially 1000 grams or less safe operating tension. Accordingly, the table shown starts with the 1,079 gram S.O.T. for #27 wire.

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We have plotted in the third column of Table I the values for tensions permissible for copper wire to the nearest gram. While it should be considered significant in most instances, variations should be anticipated as wire drawing techniques—and thus the safe loads—change. Repeated drawing and stressing results in the realignment of the submicroscopic particles in the wire. This in turn changes its relative tensile characteristics. The strength per square inch is therefore subject to variation, as it is influenced by the repeated drawing and forming processes, the in-between annealing operations and the resulting hardness, the influence of the atmosphere or special gases upon the wire, its purity, temperature and other factors.

It is self-evident that once these tensions are known they can be checked readily with a tension meter inserted into the drawing or winding process such as is shown in Figure 1.

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This photograph was taken under actual running conditions showing the winding of magnet wire on a Universal Winding machine. The insulated wire coming from the magazine spool is passed through tension adjusting devices. Then, before the wire reaches the end product, which in this instance is a wound coil for small transformers, its tension is measured by the simple insertion of the trigger operated tension meter.

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Once the best running tensions are known for a given type of wire, the same tensions then are set on all the other positions with the aid of the tension meter. Thus simultaneous production of uniformly wound coils is facilitated, since the tension on all magazines is adjusted in such a manner as to deliver the wire simultaneously with the correct tensions. Since all mandrels are rotated at the same time at the same speeds, uniformity on the ultimate receiving end is achieved and a better coil produced at higher speed. With fewer ends-down and with uniform hardness of packaging, this will provide better electrical and mechanical characteristics in the finished product at higher production speed.

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Thus, as simple a thing as a routine of measuring standard tensions markedly assists in improving product quality and coincidentally increasing production.

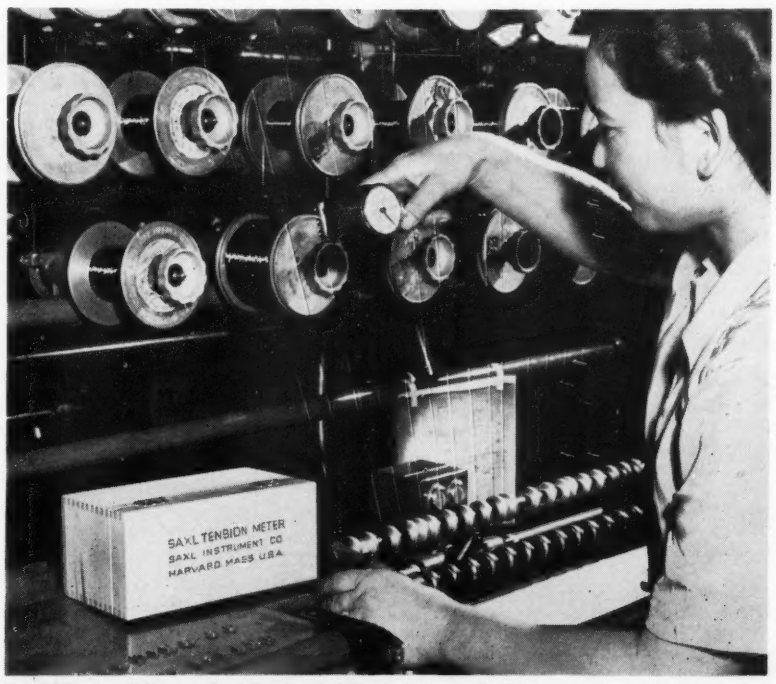

Fig. 1. Tension Meter to check Tensions while the Wire is Running. Courtesy of Tensitron, Inc.

The Desired Electrical Qualities of High Voltage Cable Paper

by William A. Del Mar
Chief Engineer Habirshaw Division
Phelps Dodge Copper Products Corporation
Yonkers, New York

Anyone who has seen an impulse generator discharge a million volts across a five foot gap, must pause to wonder at the ability of less than one inch of oil impregnated paper to withstand repeated shocks of that voltage.

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Neither paper nor oil will perform this wonder. It is the combination of the two, whereby the effective thickness of the oil layer is increased by its tortuous passage through the paper, and its turbulent ions balked by collision with the cellulose fibers, which gives impregnated paper this extraordinary property.

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Let us consider what has been done to take the greatest advantage of this material and what possible steps may be taken in the future for its enhancement.

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Being an electrical engineer, not connected in any way with paper manufacture, your Chairman has placed me in a somewhat invidious position in asking me to address a group of people who are experts in the field of paper technology. However, it is possible that the user of paper may be taking a look into the future in a way that is foreign to the thoughts of those engaged in manufacture. I shall begin by quoting from the minutes of a recent meeting of the Insulated Conductors Committee of the American Institute of Electrical Engineers.

> **"One of the first problems under investigation is to determine what the carrying capacity of a pipe-type paper insulated cable would be at voltages up to 350 kv. So far, the indications are that there will be serious limitations, unless a power factor lower than that normally obtaining for oil impregnated paper can be attained and can be relied upon to remain essentially constant throughout a long service life of such a cable. It seems that with the trend toward still higher voltage cables, the possibility that may now or in the future be offered by synthetic films to successfully replace paper insulation for such extra high voltage cables should be carefully investigated. A very interesting discussion ensued in this connection in which it was pointed out that there is nothing available in such films at this time to fulfill the requirements, but also that there is some active thought in some quarters being given to this problem with the prediction that within 10 years extra high voltage cables utilizing such films will be commercially available."**

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I might add to that the fact that when I was in Europe, in 1952, I saw some interesting work in progress along these lines, both in Germany and in France. If synthetic films find their way into extra high voltage cables, it will not be long before they find their way into the great bulk of cables of medium voltages. The paper industry should not delay in preparing to meet this competition. I shall return to this subject later.

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For the benefit of those who may read this paper, but are not paper specialists, I ask your indulgence if I say a few elementary things about cable paper manufacture. Please correct me if I make any mistakes.

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The pulp for cable paper is made in Sweden by Sulphate process from Spruce, which is used because of its fiber length. The imported pulp resembles stiff cardboard. Paper is made by mascerating the pulp in water, depositing it on a wire screen through which the excess water escapes, and subjecting the deposit to successive rolling operations which reduce the mass to the desired dryness, thickness, smoothness and density. Two types of machines are used, the **Fourdrinier**, which operates on a single layer, and the **Cylinder Machine**, which may have from 2 to 7 cylindrical wire screens and which rolls together two or more layers of pulp into one thickness of paper.

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If paper is viewed against a light, it will be seen to present the appearance of a cloudy sky, with relatively clear parts corresponding to the blue sky. These are called windows and the cylinder process, with its superimposed layers, reduces the contrast between windows and clouds.

Cable voltages are rising steadily to take care of the rising loads on the electric power systems. Cables operating at 138 kilovolts are now common, and several are either operating or on order here and abroad for 230 kilovolts. An important Midwest utility is now considering 350 kilovolts, and in Sweden cables are operating at 425 kilovolts. Cable paper now made is adequate for 138 kilovolts, just passable for 230. but useless for 350 and over. While the cables in Sweden are paper insulated, they are operating under conditions of temperature and heat dissipation which are extremely favorable, and they would be quite useless under normal conditions in this country. Paper manufacturers are asked to wake up to this situation and be ready to supply paper suitable for these voltages. The alternative is the probable abandonment of paper in favor of some synthetic film.

Mr. Del Mar delivered this paper on April 13, 1954, in New York City at a meeting sponsored jointly by the American Society for Testing Materials and the Technical Association of the Pulp and Paper Industry. It is published through the courtesy of the author and his company.

Manila Rope to Wood Pulp

Until about the end of World War I, cable paper was made from discarded Manila hemp rope. This was then preferred over wood pulp paper because it was better able to withstand the jerks and shears to which it was subjected in the crude taping machines of those days. Used rope, however, became quite scarce toward the end of the war, possibly because so much of it was sent to Davy Jones' Locker by German submarines. Furthermore, the quality of the available paper greatly deteriorated due to the presence of foreign particles and to the efforts of the manufacturers to economize the scarce hemp by making paper of low density, of which more will be said later. It therefore became necessary to find a substitute. Laboratory tests showed that no American wood pulp paper was worth a trial on cable and not much more success was obtained with paper imported from Italy.

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Some cable that looked much worse than it really was dated from this period, but a way out was found by making better taping machines and by using paper made in America of wood pulp imported from Sweden.

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The Swedish forests from which this pulp was derived are composed of planted spruce trees which are cut at a uniform age, thereby ensuring the utmost uniformity of product. So far as is known, no such practice has been used by producers of American wood pulp. Here is an opportunity which American pulp producers have been slow to embrace.

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During World War II the supply of Swedish pulp was jeopardized by a new generation of German submarines. In the intervening years between the two wars, the American pulp industry had done very little to make us independent of foreign supplies. At that time we set up a laboratory paper-making outfit, with miniature testing equipment, to work in collaboration with American manufacturers toward the development of an all-American cable paper. Partly because of the non-uniformity of American pulp, and partly because the Swedish supply never gave out, this attempt was abandoned and Swedish pulp remains the standard for cable paper today. If the present cold war should turn hot, the Swedish pulp supply would be cut off completely. Can we do anything about it now?

Paper Density

When I entered the cable industry toward the end of World War I, considerable trouble was being experienced with failures on the routine high voltage test. The men manufacturing cable were sure that the supplier of the impregnant, which was then petrolatum, had done something to spoil their product, a very natural suspicion in view of the fact that the only petrolatum available was that in excess of the requirements of the Cheeseborough Company to convert into vaseline and offered to the cable companies on a "take it or leave it" basis. Our Research Department suspected the paper, and in this belief, I spent several days at the mill which supplied our paper, looking over their records and trying to coordinate their manufacturing control test data with failures of cable manufactured with various lots of paper. This, of course, was in the days of Manila rope paper. A new testing device had recently been tried, the **Gurley Densometer,** which measured the permeability of unimpregnated paper to air. This device forces air through a standard area of paper (usually 1 sq. in.) under a pressure of about 567 grams per sq. in. and enables the time for 100 cc. of air to pass through, to be measured. This time, in seconds, is called the **Gurley Density.** I found that the paper being supplied to us was of extremely variable Gurley Density, ranging from 3 to 18 seconds. The paper mill was apparently aiming for low density to economize the precious fiber. I found that the cables that had failed were made from rolls of very low density paper. We rejected all paper with a density of less than 20 seconds and the epidemic of cable failures stopped.

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Gurley Density, however, is not only a function of the amount of pulp used, but may also be varied by average fiber size, shape and range of fiber sizes; also by degree of physical modifications in the processes and by calendering technique used on the paper sheet.

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Fortunately, ignorant of these complications, we asked for higher and higher Gurley Density and found that we obtained greater dielectric strength with each increment of density, although at a diminishing rate. When we came to use wood pulp paper, we found a density of 350 seconds somewhere near the top of the curve for 60 cycle cable dielectric strength, and 4000 seconds for impulse strength.

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Then a bomb was dropped on the cable industry by **Dr. J. B. Whitehead,** of Johns Hopkins University, the repercussions of which are hardly over to this day. He showed, by a series of carefully performed tests, that the dielectric strength of small cable-like samples was greater the lower the density of the unimpregnated paper used in their manufacture. He explained this on the basis that the higher the density, the higher the permittivity of the impregnated paper, and therefore the greater the electric stress on the oil in the gap spaces at the edges of the tapes. With rising voltage, on test, the oil would ionize and precipitate failure of the cable.

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For some time the discrepancy between Dr. Whitehead's results and those of these manufacturers was not satisfactorily explained. Dr. Whitehead confirmed his findings by additional tests on small samples and the manufacturers confirmed theirs by controlled tests on cables.

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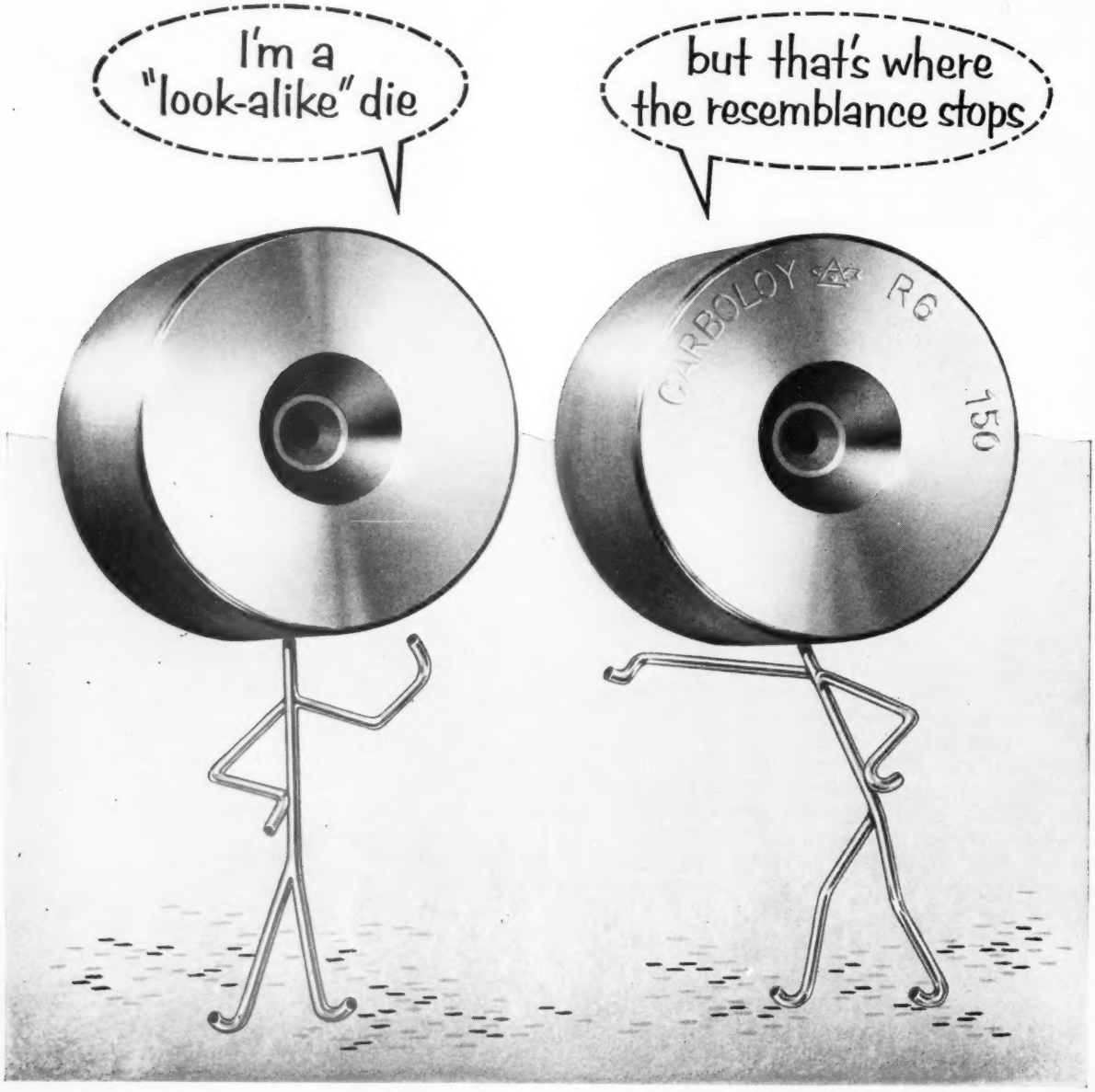
Finally the conflict of data was resolved in this way. Where the insulation is thin compared with

(*Please turn to page* 777)

9 reasons why you



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Impressions of the U. S.

by Maurice Bonzel, President
Ets. Trefileries Bohin
Issy les Molineaur (Seine), France

An address given at the Annual Meeting of the National Trade Association for the French Steel Wire Drawing Industry in Paris.

Mr. Bonzel was the group leader of the French Steel Wire Productivity Team that visited this country in 1953 under the auspices of the Industrial Technical Assistance Division of the Foreign Operations Administration. The address was made after the return of the group and is reproduced here in somewhat abbreviated form. The translation was made through the courtesy of the good offices of the French Embassy.

Introduction

Time and again since our return, each member of the team has had to answer this question: "What have you seen there that was interesting?"

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If the answer must be summed up in a few words, it can only be this:

We have seen plants working at full capacity, day and night, with order books filled up for the next six months and expansion programs stretching out over the next five years. We have seen an immense population, in which good spirits predominate, express by its work and its way of life, its individual faith in human possibilities, both at the level of the individual and of the nation.

★ ★ ★

Such a statement is so surprising to French ears that it usually meets with much skepticism, and productivity "missionaires," as they are called[1], are frequently considered, upon their return, as lunatics or as the victims of some kind of collective hallucination and whose utterances should be greeted with broad understanding smiles.

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As you know, lunatics are affected with a pet obsession, of proving that they are not lunatic. But, I have no intention to defend myself here nor my fellow members of the Steel Wire Drawing Team; instead, I shall attempt to explain to you how we came by this fit of lunacy.

(1) Productivity teams are called "missions" in France—hence the familiar neologism "missionaire" for team members.

Our group, originally made up of thirteen different men, different in all respects as to age, place of residence, background and position, have returned as **one.** Our small group has found its unity in the fulfillment of the important "mission" with which you had entrusted us. In talking to you today, I am nothing more than the spokesman of the thirteen members of the Team. Let me remind you of their names: **Henri Bossu, Jean Chaudouet, Andre Dunand, Pierre Husson, Michel Jeanmaire, Francois Jacquemin, Bernard Labbe, Maurice Laudet, Jean Legregeois, Rene Longeras, Emile Robbe, Johannes Wehrenberg** and myself.

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All, I can assure you, have shown the greatest devotion to our trade and are entitled to your gratitude and your encouragement, not only for what has already been achieved but for what remains to be done.

Arrival in the U. S.

It was a pleasant surprise for us to be received on the train platform by a representative of the Mutual Security Agency, two interpreters and a secretary from the French Embassy, who were to escort us during our tour of the U. S.

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It was only then that we became conscious of the distance that separated us from France—these various officials whom we had imagined asleep or grumbling about our late arrival welcomed us with surprisingly good spirits, although it was late at night (3:30 A.M.); each one of them had already memorized our names, even our first names, and our faces (from advance photos). For them we were not the anonymous representatives of a distant Trade Association, but Pierre, or Maurice or Jean, with definite ideas and interests of our own which they had imagined in advance, whereas we had paid no attention to the list of their names even though it had been handed to us in Paris.

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This importance given to the individual, to the personality of each, we noticed everywhere in the U.S.A., at all times, together with a high sense of individual responsibility; you find no abstract anonymity in the United States, you find men who live, think and act with a strong sense for concrete things.

The Program: Technological Aspects

We were taken first through the program of conferences that had been planned for the first two days. We heard much about productivity, market research, the evolution of labor unions in the past 50 years, the prosperity of the United States and the possibility for all other

free nations to obtain a similar prosperity. Yet, despite the interests of these lectures, we were impatient to start on our program of plant visits, for we were convinced that only these visits would enable us to understand the real advantages of the system whose merits were so enthusiastically described to us.

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From the first we were struck by the two following facts:

1. **There is no essential difference between American wire drawing techniques and ours.**
2. **Manufacturing costs are of the same order of magnitude in both countries, although frequently a little more advantageous for U. S. plants in spite of the fact that wages are considerably higher in the U. S.**

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By and large technical processes are identical; we were able to verify this fact; it did not come to us as a surprise, however, for we knew that as soon as a technical improvement is discovered, its use is immediately disseminated all over the country, and it soon becomes known in all countries of the world where constructors try to sell their machines and their processes.

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We found in the U. S. cleaning houses that looked very familiar, with their sulfuric acid vats, their heating installations, their wash baths, lime-baths, their flash-bakers, and the men in charge of these shops have told us their worries—the same as ours—concerning, in particular, the disposal of waste solutions.

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Scale-breaking has been tried, but it was evident that it is not widely used; the same is true of phosphating. On the other hand, we have noted that the washing of bundles is done with great care and so are the lime-coating operations, which commonly include two successive baths with drying in between: the first solution is quite light, the second more concentrated.

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Dry wire-drawing is, of course, almost universally used. But one finds examples of wet drawing with the usual accompaniment of vats, copper and tin baths.

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Vaughn machines are very much in evidence in most of the plants we visited, but there are many Morgan slip-machines, and even some single benches, especially for the manufacture of high carbon steel and special alloy wires.

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Dies are usually made and polished in the same way as ours, and the compositions of lubricants are similar, but drawing speeds are generally higher: 1800 feet/minute is common for low carbon and 1200 for high carbon.

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We often wondered whether the preference for Vaughn machines was due to the principle of backpull, and we never missed an opportunity to inquire about it from the engineers we met. The result of this investigation is quite clear: American wire-drawers do not seek backpull and the popularity of the Vaughn machines we saw cannot be ascribed to it. Many of these machines, in fact, have been working for ten years, in three shifts, without a single breakdown and without maintenance cost.

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Generally speaking, American equipment is extremely robust; it is built with great care and precision, and with high quality materials; it is always used well below its maximum capacity; it is expensive, but efficient.

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As regards heat treatment, we must point out that oil or natural gas are most commonly used for heating and that bell-type furnaces are almost exclusively used for annealing.

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Patenting installations are remarkable in that their take-up blocks are usually split into small groups of a few spools only, so that it is possible to treat different size wires at the same time: such a method has the advantage of reducing delivery time and inventories.

There is nothing special to be said about galvanizing installations except that we should mention an electro-galvanizing process, the cost of which does not seem higher than that of the hot dip process.

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Nail machines, barbed wire machines, wire netting looms and cable-making equipment we have seen are no different from ours.

A Few Production Figures

Because of the many visits and of unusual (for us) proportions of the plants we were going through, it took us some time to understand how, with a similar number of workers, their production was three or four times as high as ours.

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Here are some figures:

- **—A 50-ton load of steel rods is unloaded, sorted and stored in one man-hour.**
- **—It also takes but one man-hour to clean 10 tons of rods in a properly installed cleaning house.**
- **—A clever installation enables a single worker to draw 6 tons of steel rods down to a gauge 5 wire in his regular 8 hour shift.**
- **—It takes one man to galvanize 8 tons of gauge 16 wire in 8 hours.**
- **—One man alone working 7 machines produces 2 tons of nails gauge 17.**
- **—6 tons of nails, per man and per shift, can be barreled, cleaned and packed in small 23-lb. kegs.**

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Only long and patient efforts bearing on the smallest details can bring such results. A wire-drawing plant near Cleveland could sum up its evolution as follows:

- **—1941: It produced 1,000 tons a month with 600 employees of whom 35% were indirect labor (what we would call "non-productive").**
- **—1953: It produces 1500 tons a month, with only 235 employees, 40% of whom are "non-productive".**

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One has to picture, behind this impressive account, the long and continuous effort that has gone on day after day to reduce the time of operations while reducing the workers' physical exertions and improving the quality of the products.

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These efforts embraced everything: shop and machines layout, quality of lighting, the heating sys-

tems, floors (metallic for trucks, rubber-coated where men stand), the design and quality of hand tools, of rod flippers, of trucks, of unloading platforms and, to a large extent, of all handling equipment.

Productivity—The Enigma

Now, can we use the same methods and pay our workers much higher wages, similar to those that workers earn in the United States for work that is often easier than here?

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To word the question like this, limiting it to the purely technical aspects of the problem, is in my opinion a grave error. The high American productivity is not only the result of technical progress; it is the ultimate outgrowth of a philosophy accepted and applied by a whole nation at all levels of production, distribution and consumption.

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Contrary to current belief, productivity, as an essential element of a national economic policy, is a recent discovery; it was only at the time of the Korean war that it asserted itself as the principal factor of prosperity in the U.S. This idea is held not only by big business executives, but also by labor leaders (AFL, CIO).

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In 1945, this was the situation in the U.S.:

—Production capacity had doubled since 1940.

—Within a few months, 5 million discharged veterans had poured into the labor market.

—Big armament orders that had kept all plants functioning were abruptly stopped.

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Logically, such a situation could only lead to unemployment and to an economic depression similar to that of 1929, which is still present in everybody's mind.

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This economic disaster did not occur because, thanks to its high productivity, American industry was able to do a rapid reconversion and to place a huge mass of consumer products on the market.

These products, that competition maintained at low price levels, were easily absorbed, for, on the one hand, careful market research showed that they were indeed what consumers wanted; and, on the other hand, to a liberal credit policy were added intense advertising campaigns which whetted the consumers' desires and, in some cases, even created new wants.

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By these means, the aluminum industry was able to keep up its production; the steel industry maintained its output of 100 million tons (as against prewar figures of 60 million), the yearly sales of cars doubled and the building industry started on a boom that is not yet ended.

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Yet, whatever the type of production, it always employs less men than in France. In terms of man-hours, it takes in the U.S. four times less man-hours to manufacture an automobile, three and a half times less to make a pair of shoes, five times less a shirt or a suit, ten times less a pair of socks, six times less a refrigerator or a washing machine.

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The same is true in agriculture, where eight million American workers feed a population of 160 million inhabitants, while in France an almost equal number of workers, i.e. seven million, are needed for a population of 42 million. Two pounds of butter cost the equivalent of 50 minutes of work in the U.S. at the average hourly wage-rate, as against six hours of work in France. We have visited chicken farms and dairies, where manpower is kept at a minimum and one man, for instance, can take care of 200 milch cows.

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There is no denying that the freely disposable income left to the average American earner after paying for food and other essentials of life is much higher than in France. This high percentage of disposable income is the basis of the broad and deep markets for manufactured goods, services and building. But should we conclude that the price of food in France is too high in comparison with current wages, or that wages are insufficient in comparison with agricultural prices, because productivity lags behind?

Importance of "Delivering the Goods"

Coming back to our own trade, wire drawing, we have noticed that in all companies marketing comes first. Management people never hesitate to declare that manufacturing is easy, but selling very difficult. In wire drawing companies, as in all other industries, selling comes before engineering. The customer is king: in exchange for a carefully established price, he is guaranteed decent quantities of products and dependable dates of delivery.

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This dependability of delivery schedule is one of the major characteristics of the American industrial market. Just remember that one of the wire-drawing plants we visited never kept in stock more than a two-weeks supply of rods. They had placed their orders with the steel mills for a period of six months, with a precise staggering of deliveries, and neither party was even remotely considering any alteration to this program.

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But while the customer is king, it is only within certain limits. To depart from these limits is costly. Manufacturers select carefully a certain number of products to which they devote all their efforts. Then they direct their customers toward these standard products, for which customers are sure to get a better price, a better quality and better delivery dates. Non-standard products can be obtained, but at considerably higher prices.

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Some plants are highly specialized and mass-produce one or two products only. Other plants, staying off the beaten track, take in small orders for special products which they sell at high prices. Others still use both methods; but in all cases, standard products sell at much lower prices than non-

standard products.

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This orienting of customers toward mass-produced articles is extremely efficient: thus a large nail-manufacturing company has brought the number of its products down to 12; thus also, only two types of barbed wire are manufactured: both wire-drawers and their customers, the farmers, agree that these two types are quite sufficient for most needs of the home market.

The American Worker Today

I should like to end by saying a few words about the American worker. I must admit that after reading Taylor on work-simplification and after hearing of Time and Motion study, Bedaux system, assembly-line production methods, I pictured to myself the American worker as a carefully trained automaton, topping all production records, thanks to perfectly conditioned reflexes, like those of an athlete.

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The reality is quite different; all this belongs to the past, and it is no exaggeration to say that in this field a true revolution has been achieved in the past few years.

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Careful study has carried simplification of motion to such a degree that machines can now do the work; automatic gestures have disappeared; there are no more automatons in shops, only **men** who think and live according to their own individual personalities. These men, freed from automatism can become interested in their work and in the functioning of their machines. Those we saw during our visits never hesitated to come to us, to talk about their work, and to ask our opinions or give us theirs on particular problems.

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Our bus driver, on the trip from Cleveland to Chicago, made us a nice little speech as we were leaving him, in which he expressed his pleasure at having driven us through his country; he explained that he himself had worked in a drawing plant once, even though he was now a bus driver (and a good driver too); he felt that he had his own part to play toward the success of our team—and that he did with the greatest good conscience.

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This attitude is characteristic of the American worker of today; there is no class struggle in the United States, for there is no class prejudice. There are only men who, on the individual level, esteem and respect each other, which incidentally does not exclude at times violent conflicts of interests, but such conflicts are always dominated by a sense of fair play and loyalty.

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Labor leaders themselves contribute to the enforcing of this rule, as the following example shows:

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A group of bundle-makers in a wire-drawing plant once asked for a rate increase. Management turned their request down. After conducting an investigation, the local union decided to intervene. These workers produced an average of 35 bundles per hour; union officials pointed out that they knew of better installations that made it possible to obtain much higher bundling figures, and consequently reduce costs while raising wages. A new installation was accordingly set up, and a new rate proposed, on the basis of 135 bundles an hour. The workers protested, refused, argued and referred the matter back again to the local union which this time refused to defend them. Finally, they reached a compromise agreement on the basis of 110 bundles per hour. The labor official who told us the story added: "Actually, they could easily have produced 200 bundles an hour. It's attitudes like this that eventually ruin our effectiveness. We have an educational job to do. It's our function to take every opportunity to improve our members' working and living conditions, but we defend only good causes."

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While we cannot underestimate the influence on the worker of the comfort which he finds in the plant—cafeterias, cold drinks dispensers, and many other facilities —we feel that there is another factor still more influential; i.e. the possibility for him to drive home after work in his own car to a house he owns, that is comfortably furnished with a refrigerator, a washing machine, a modern kitchen, a telephone and television, mostly bought on credit.

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My dear friends, you may think that this extraordinary dissemination of credit is a sign of weakness, a dangerous crack in the building. You may be right; yet, I cannot help thinking that the buying of a refrigerator on credit is in itself an act of faith. It represents, down to the level of the individual or of his family, the starting point of an expanding economy.

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Think of what such an act of faith can mean, when it is repeated by 160 million people: it means a great nation, full of faith in its institutions, full of faith in its future, proud of its flag, which we could see streaming not only on top of the country's monuments but also in front of plants and even inside shops.

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This act of faith, this tranquil assurance of a whole people whose houses never have fences, forces our respect and incites us to think.

Conclusion

We have noted that American wire drawing plants used three times less man-hours on an average than ours for the same production. The same can be said of all branches of production and distribution.

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We are absolutely convinced that similar results can be obtained in France, but on condition that we do not limit our efforts to purely technological improvements. The proof of this lies in the fact that American companies with plants in France find it extremely difficult to match their American production figures.

(*Please turn to page* 781)

Government Wire Production Information

More Chilean Copper Contracted For

The General Services Administration has announced that it has signed a contract with the **Anaconda Sales Company** for the purchase of 64,000 tons of copper produced in Chile.

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The material will be delivered to the National Stockpile, according to Edmund F. Mansure, Administrator of General Services. The price, including delivery to storage point, is 30 cents per pound, less allowances, for cathode copper.

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Mr. Mansure said that part of the copper is already in the United States and will be transferred to the stockpile at once. The balance will begin moving to destination almost immediately.

It was also revealed that an additional contract for 36,000 tons of Chilean copper is in process between the Government and the **Kennecott Sales Corporation,** acting as Agent for the Central Bank of Chile. He said the same terms would apply to this agreement and that he expects it to be signed shortly.

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This would conclude a total purchase of 100,000 tons of copper from Chile. An announcement that the United States Government was preparing to negotiate these purchases was made by the Department of State on March 25, 1954.

More Aluminum Available

Production of aluminum from new facilities created under the Government's expansion program was expected to reach 403,407,600 pounds during the second quarter of 1954, according to **Edmund F. Mansure,** Administrator of **General Services.**

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Mr. Mansure also announced that nearly 80 million pounds will be supplied to non-integrated users to whom under GSA contracts with three primary producers, a percentage of new production must be offered.

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"This contractual requirement has again been met by the companies," Mr. Mansure said, "ensuring a fair distribution of available metal to non-integrateds. We think the program is working out very successfully. There have been no instances in the last six months in which non-integrated users have advised us that metal was not available."

New Copper Contract

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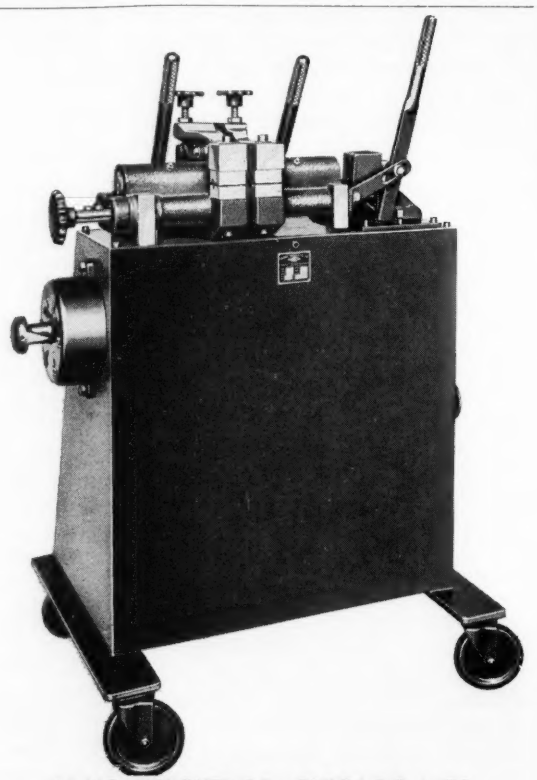

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national stockpile has been signed with the **Kennecott Sales Corporation,** acting as Agent for the Central Bank of Chile, the **General Services Administration** has announced.

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The purchase price is 30 cents per pound, less allowances, for fire-refined ingot copper. Delivery to storage point is included.

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Edmund F. Mansure, Administrator of General Services, said that this contract concludes the negotiations, first announced on March 25, 1954 by the State Department, for the purchase of 100,000 tons of Chilean copper.

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An agreement was signed last week, for 64,000 tons, with the Anaconda Sales Company. Deliveries to stockpile points will begin at once.

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The contract formula applied in the program calls for offering non-integrateds two thirds of new production after a proportionate share of set-asides for the AEC and Department of Defense, and requirements of the national stockpile from new aluminum facilities.

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This formula applies for five years from the time expansion started. For the following 15 years, the producers will offer 25 per cent of expanded production, instead of two thirds.

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Companies producing in the program are the **Aluminum Company of America, Reynolds Metals Company** and the **Kaiser Aluminum and Chemical Corporation.**

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Total production from new facilities for the first quarter of 1954 was 260,887,000 pounds. For the last quarter of 1953 it was 231,000,000 pounds.

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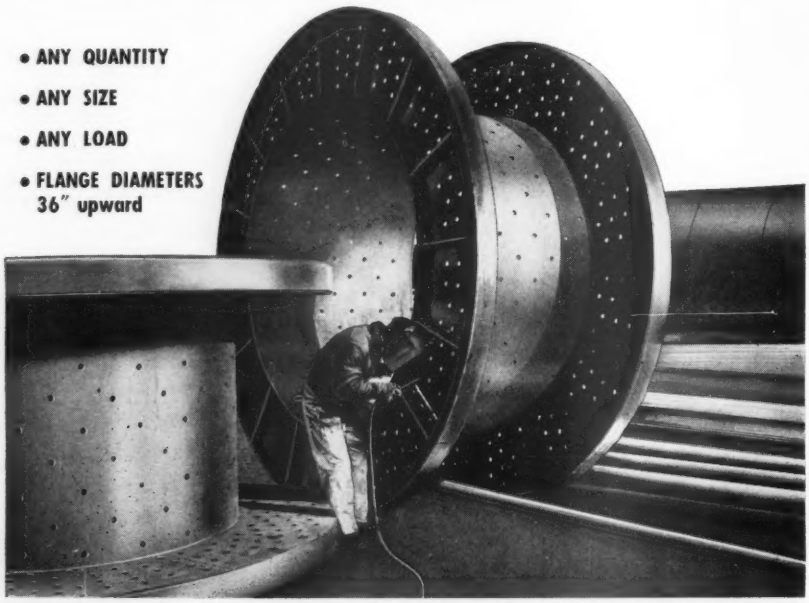

ABSTRACTS

THE MANUFACTURE OF HYPODERMIC NEEDLE TUBING.
Accles & Pollock Ltd., Oldbury, Birmingham. Machinery (Lond) 1954 Vol 84 (2159) pp 679-686 (Apr 2)
Drawing machines, straightening machines, and inspection and length-checking problems discussed, as well as preparation and maintenance of drawing dies. Drawing dies down to 1.5 mm are of sintered carbide; below this size, diamond. Piercing done on small vertical machine of E. Pivot, boron carbide of 200 mesh size being used as abrasive for sintered carbide dies. Subsequent operations with diamond dust suspended in olive oil. Grain sizes are: (a) 18-20 micron for starting; (b) 10 micron for medium polishing; and (c) 4 micron for polishing. Whole sequence completed in about 4 hr. Repolishing of diamond dies on horizontal machines and Bsteh type machines described. Following service data given: diamond die of 0.65 mm dia for tubing drew 163,000 ft, after which it was opened to next standard size of 0.7 mm. Another die for drawing 1.3 mm dia tube produced 253,000 ft. before it had to be opened up to 1.35 mm dia. 12 illustr.
G **C 11.0 : D 11.0**

★ ★ ★

PROBLEMS OF THE CONTROL OF DIMENSION, SHAPE AND FINISH IN THE ROLLING OF SHEET AND STRIP AND IN THE DRAWING OF WIRE
H. Ford (Imperial Coll Sci & Technol), J. G. Wistreich (BISRA). Ins Met Journ 1954 Vol 82 (7) pp 281-290 (Mar)
Paper to symposium 'The control of quality in the production of wrought nonferrous metals and alloys', London, Apr 28, 1954.

Fundamental difference between wire drawing and rolling in control of dimensions, because die bore is of fixed size; this discussed with regard to tolerances on gauge and allowable wear. Difficulties of continuous measurement and problems of ovality. Control of shape depends on same factors in wire drawing as in rolling, but factors are of different degrees of importance. Of 3 properties, surface finish least amenable to measurement and control; dependence of finish on forming process little understood. Roll finish, die polish and lubricants discussed, insofar as affecting smoothness and lustre. 3 illustr, 21 ref, 4 tables.
Y **C 11.0**

★ ★ ★

STAINLESS STEEL WIRE
J. Lomas. Machinery Lloyd 1954 Vol 26 (5A) pp 61-63 (Mar 6) (Also in French and Spanish)
High carbon, high chromium steel dies for reduction to 0.06 in. dia. Tungsten carbide dies used down to 0.02 in.; diamond dies in multiple die machine for finer wire: about 12 dies required for reduction from 0.021 to 0.012 in. Advantages of annealing. Crystallographic basis of wire drawing. Brittleness avoided by controlled annealing temp and yield point. Soluble oil and water used as lubricant for diamond dies; otherwise soap and lime.
R **C 11.0**

★ ★ ★

CHANGE OF ELECTRICAL RESISTANCE AS A RESULT OF COLD WORK

H Weyerer. Zeits Metallkde 1953 Vol 44 (2) pp 51-58; Inst Met Journ Metall Abst 1954 Vol 21 (6) col 509-510 (Feb) (Original in German)
Electrical resistance measurements on cold-drawn and annealed Cu. Fe, Al and brass wires carried out in apparatus permitting imposition of tensile stress during resistance determination. Found that wire drawing of annealed metals raises resistivity, except for carbonyl Fe, but wide variations between different metals; marked increase in resistance of brass confirmed.
Y **C 11.0**

★ ★ ★

THE NEW ROD, SECTION, AND WIRE-DRAWING SHOP OF THE METALLWERKE AG, DORNACH
W. Anstaett. Pro-Metall 1953 Vol 6 (35) pp 242-247; Inst Met Journ Metall Abstr 1954 Vol 21 (6) col 578 (Feb) (Original in French and German)
Y **C 11.0**

★ ★ ★

THE PROCESSING AND DRAWING OF STEEL WIRE
P. A. Beaman (Morgan Construction Co.) Iron & Steel Eng 1954 Vol 31 (1) p 83 (Jan)
Abstr of paper to Assoc Iron & Steel Engs (AISE) meeting, Los Angeles, Feb 15-17, 1954.
Y **C 11.0**

★ ★ ★

HIGH SPEED DRAWING OF LOW CARBON STEEL WIRE
I. N. Nedovisi, A. L. Tarnavski. Sowjet Buchneuerschein 1954 (223) p 21 (Apr 9) (Original in Russian)
Book, Metallurgisdat, 240 pp. Working experience of a collective at Lepse plant in Magnitogorsk. Technology of wire production is detailed. (Book not in library of Ind Diamond Inf Bur).
G **C 11.0**

★ ★ ★

FORTLAUFENDE KERNGEWINNUNG MIT UNGEKEHRTER SPUELUNG. CONTINUOUS CORE DRILLING WITH COUNTER FLUSH SYSTEM
B. Petuch, Erdoel Zeit 1953 Vol 69 (12) pp 161-169 (Dec) (In German)
8 illustr.
H **C 9.0**

★ ★ ★

THE PHENOMENON OF SPONTANEOUS APPEARANCE OF FACETS ON WIRES OF POLYCRYSTALLINE METALS DURING STRETCHING
P. D. Novokreshchenov. Doklady Akad Nauk 1953 Vol 91 (1) pp 123-124 (July); Battelle Techn Rev—Abstr 1954 Vol 3 (3) p 176a (Mar) (Original in Russian)
Importance in wire drawing, especially at temp near recrystallization point, discussed.
Y **C 11.0**

★ ★ ★

INTERNAL GRINDING MACHINE FOR SINTERED CARBIDE DIES
Rudkin & Riley Ltd, Aylestone, Leics. Ind Diamond Rev 1954 Vol 14 (161) p (Apr)
New machines which can be used with attachments for external and wet grinding. Automatic reciprocating traverse of grinding head with adjustable stroke of 4 in. max. Reciprocating movement obtained by separate ½ hp motor. Grinding wheel on air-cooled grinding spindle

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The excellent flow properties of this wire assures uniform, strength-giving grain structure which "trademarks" high quality production. The structural soundness and uniformity of "Special Processed" wire is the result of careful selection of raw materials, our own exclusive drawing and heat treating process, rigid quality controls and inspections.

Keystone is doubling its production capacity on "Special Processed" Cold Heading Wire to keep pace with the ever increasing demand of old and new customers alike. Your inquiry is welcomed.

INDUSTRIAL WIRE SPECIALISTS

Keystone Steel & Wire Company
PEORIA 7, ILLINOIS

rotates at 20,000 rpm; tested for safe running at 60,000 rpm. Attachment for lapping and polishing parallel bores down to fine dia can be fitted.
G **D 11.0**

★ ★ ★

PRECISION TUBES FOR THE INSTRUMENT MAKER
J. T. Sparks (Accles & Pollock Ltd). Instr Pract 1954 Vol 8 (2) pp 135-141 (Feb)
Describes briefly production and uses of small thin-walled tubes. Special techniques developed for drawing capillary seamless tubes, in various materials, eg copper, copper-nickel, aluminum, mild steel, stainless steel and monel metal. Tooling said to be most important. Illustr of precision tube being drawn through diamond die onto coiling drum. Informative general article. 8 illustr.
G **C 11.0**

★ ★ ★

DIE ENTWICKLUNG, HERSTELLUNG UND NACHARBEITUNG VON ZIEHSTEINEN. THE DEVELOPMENT, PRODUCTION AND REMACHINING OF DRAWING DIES
V. Wegener. Draht-Welt 1954 Vol 40 (6) pp 65-68 (Mar 25) (In German)
(To be cont.)
G **C 11.0 : D 11.0**

★ ★ ★

CHANGE OF THE MODULUS OF RIGIDITY IN METAL CAUSED BY COLD DRAWING AND ANNEALING
H. Yamamoto, H. Takei (Hiroshima Univ). Nippon-Kinzoku-Gakkai-Shi 1952 Vol 16 pp 128-133; Chem Abstr 1954 Vol 48 (5) col 2536 (Mar 10) (Original presumably in Japanese)
Y **C 11.0**

★ ★ ★

COATING PAVES WAY FOR DRAWING SPEEDUP
Anon. Steel 1953 Vol 133 pp 82-83 (Dec 21); Battelle Techn Rev—Abstr 1954 Vol 3 (3) p 178a (Mar)
Production with 3-die draw benches claimed tripled by replacing conventional line coating practice by dry thin-film lubricant.
Y **C 11.0**

★ ★ ★

MECHANICAL DESCALING OF WIRE RODS IMPROVES COATING
Anon. Steel 1953 Vol 133 pp 114, 116-117 (Dec 21); Battelle Techn Rev—Abstr 1954 Vol 3 (3) p 169a (Mar)
Descaling, drawing compounds, and diamonds used in drawing dies discussed.
Y **C 11.0**

★ ★ ★

A NEW INSTRUMENT FOR THE INSPECTION OF DIE WALLS
Anon. Ind Diamond Rev 1954 Vol 14 (161) pp (Apr)
By introducing highly polished conical mirrors from the back through a die hole and viewing the mirror, the structure of the die wall can be easily observed. Inspection by moving the conical mirror along the die hole gives information on polish and wear of sintered carbide and diamond dies.
G **D 11.0 : D 15.2**

★ ★ ★

W. D. COOLIDGE, 80 YEARS
Anon. Wire & Wire Prod 1954 Vol 29 p 220 (Feb); Ind Diamond Rev 1954 Vol 14 (161) p 94 (Apr)
Formerly vice-president and director of research of Gen Electr Co; noted for discovery in 1908 of method of producing tungsten wire for electrical filament lamps, a process only possible by use of diamond dies. Other inventions also.
G **C 11.0**

★ ★ ★

These abstracts are furnished through the courtesy of the Industrial Diamond Information Bureau, 32 Holborn Viaduct, London, ECI, Eng. Requests for further information should be directed to the Bureau.

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CABLE AND WIRE ROPE MAKING MACHINERY of every description.
HIGH-SPEED BUNCHING MACHINES.
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STRANDING MACHINES for absolutely tortion-free Wire Ropes.
PLANETARY STRANDERS for all duties, especially for hollow, sectorial, and pre-formed sectorial cables.
MACHINES FOR THE TELEPHONE CABLE INDUSTRY.
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ARMOURING AND PARKWAY MACHINES.
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EXTRUDERS for rubber or plastic.
COMPLETE EXTRUDING INSTALLATIONS.
INSULATING MACHINES FOR BERGMANN TUBES AND ARMOURED WIRE.
SPOOLERS, COILERS, REWINDERS.
LET-OFFS.
CONTINUOUS TAKE-UP UNITS. Integral capstan or caterpillar types.

New Bulletin on Celanese Acetate

A product data bulletin entitled, "Vacuum Forming of Celanese Acetate," has been prepared by the Plastics Division of **Celanese Corporation of America.** The 9-page presentation discusses the entire subject of vacuum packing with technical accuracy and clarity.

O. W. Titus Director of Canada Wire & Cable

O. W. Titus, vice president and general manager of **Canada Wire & Cable Company, Ltd.,** Toronto, Canada, has been elected to the directorate of the company.

★ ★ ★

T. A. Gass, assistant to the general manager, has retired after 43 years' service, dating back to the company's incorporation.

The Impact of Current Economic Conditions on the Wire Industry

(*Continued from page* 742)

This springmaker designs each spring to do a specific job. It may be in your automobile, your refrigerator, or your lead pencil. Look around and you will see thousands of places you use them every day from the time you turn off your alarm clock in the morning until you turn off the light switch at night. Each spring has a special assignment to perform. Each must operate with flawless efficiency and give long service.

★ ★ ★

At the springmakers plant you will see wire feeding into one end of a Torrington or Sleeper-Hartley coiling unit, being formed, and emerging as individual springs at machine-gun tempo. Multiply this by thousands of units fabricating tens of thousands of different spring designs, and pouring them out by the millions—and you have an idea of the scope of spring making operations.

★ ★ ★

To get large volume mass production, and at the same time, maintain precision quality in each individual spring, requires know-how and ingenuity. Everything depends on having exactly the right wire for each job, and having that wire completely uniform from coil-end to coil-end and from coil to coil.

★ ★ ★

Today that springmaker is able to get exactly the kind of steel wire he wants, with faster delivery than ever before. He is able to translate his creative design and production ideas into action more speedily. He finds the steel wire producers who are able to fit into his requirements best. And together as a team, they are making better springs at lower cost than ever before.

★ ★ ★

The past year of unusually strong competition, therefore, has had a great beneficial impact on producer-manufacturer relationships. The producer has become more intimately acquainted with the manufacturers problems, and the manufacturer has a better perspective on the producers capabilities.

★ ★ ★

They have learned to work more closely together as a team, each realizing more fully their identity of interest. Of course, there has been changes, and realignments to put the best possible teams together, and these will continue. But the net result has been to create a stronger industry for the future—an exciting testimonial to the way competition works in this industrial economy.

A Practical Analysis of the Causes of Die-Wear in Dry Drawing of Ferrous Wires

(*Continued from page* 751)

ing coats made unnecessary. This is achieved by equallizing the stresses exerted on the die face and

(*Please turn to page* 775)

CAMDEN WIRE CO., INC.

Wire Fabricators

EXTRA FLEXIBLE CONDUCTOR
STRANDED OR BRAIDED
MULTIPLE ENDS OF SIZES .008 to .002
BARE • TIN or LEAD COATED • SILVER PLATED

40 Masonic Avenue • Camden, New York

Outstanding Personalities of the Wire Industry

Firth-Loach Metals Announces Key Personnel

Last month the announcement of the organization of **Firth-Loach Metals, Inc.** was made. The company has entered the field as manufacturers of carbide metal in various forms as required by its customers, principally in the form of tips for cutting, wear, blanking and percussion applications, and inserts for dies.

★ ★ ★

The key personnel now announced are as follows:

President: L. Gerald Firth. He was formerly associated with Firth Sterling, Inc. and its predecessors from 1918 to 1926 as Works Manager. From 1926 to 1933 he was General Manager; from 1933 to 1947, President, and from 1949 to October 1, 1953, Vice President in charge of Research and Developments. He was also a director during these periods.

Vice President and General Manager: William J. Loach, who was associated with Firth Sterling, Inc. from 1927 to 1929 as Research Engineer, from 1929 to 1948 as Superintendent of the Metal Carbides Division, 1948 and 1949 as Manager of Quality Control Department of the Powdered Metals Division, and from 1949 to October 1953, as Manager of Research and Development in the same division.

★ ★ ★

Vice President in charge of Sales and Engineering: Louis De Marco. He started in 1934 with the McGinnis Tool and Die Co., Worcester. Joined General Motors in 1939 as a tool efficiency expert. Set up production tooling at Wright Aeronautical Plant #7 at Woodbridge, N. J. in 1942. Joined Vascoloy-Ramet Corporation in 1947 as Sales and Service Engineer and later was made Sales Manager of the Eastern District. Employed in 1950 as Carbide Sales Engineer by Firth Sterling, Inc., becoming Assistant Chief Engineer of the Carbide Division in 1953, which position he was holding when he joined Firth-Loach Metals.

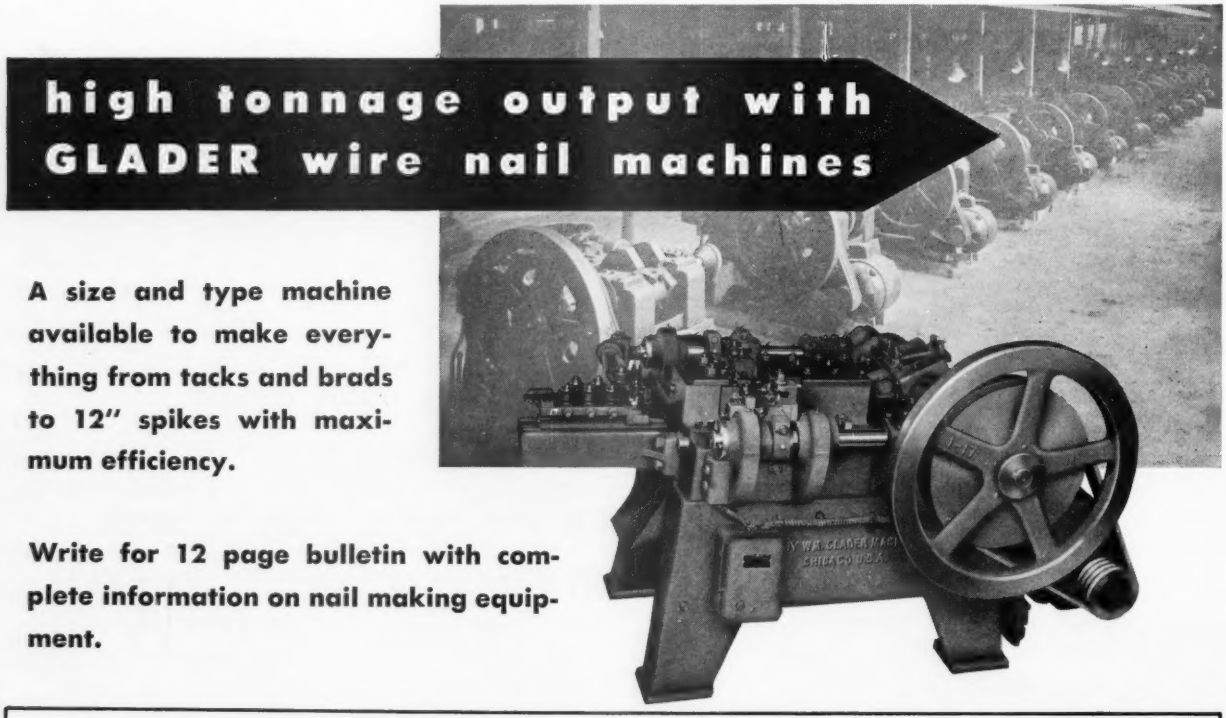
★ ★ ★

Secretary-Treasurer: Charles E. Young. He was admitted to the Pennsylvania Bar in 1922 and joined the Union Trust Company of Pittsburgh as Trust Officer. Since 1936 he has practiced law.

★ ★ ★

Comptroller: John P. Parks. Joined Snap-On Tools Corporation in 1943 as Chief Cost Accountant. In 1944 he became Works Accounting Supervisor for York-Shipley Inc., York, Pa. Joined Firth Sterling in 1946 as Carbide Division Cost Supervisor. Became Senior Cost Analyst for the United States Steel Corporation in 1951, which position he was holding when invited to join Firth-Loach.

★ ★ ★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A size and type machine available to make everything from tacks and brads to 12" spikes with maximum efficiency.
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Export Dept.: 122 E. 42nd Street, New York 17, N. Y.

Sales Manager: James E. Gray. Started in 1929 with Firth Sterling in the Production Department of the Carbide Division, being promoted in 1935 to the Carbide Engineering Division. Was made Office Manager of the Carbide Sales Division in 1943. Became Manager of Carbide Sales of the Mid-Western District in 1949 and was returned to Pittsburgh in 1953 as Assistant Sales Manager of the Carbide Division, from which post he left to join Firth-Loach.

★ ★ ★

Superintendent of Production: Robert C. Lindberg. Started his career with Firth Sterling in 1935 as an employee in the Production Department of the Carbide Division. Became Foreman for the Production of Tungsten Carbide Powder in 1936. He was promoted to Technician in this department in 1942 and was made Supervisor of the Quality Control Department, Carbide Metallurgical Division in 1951. In 1952 he was made Project Engineer for the Carbide Production Department, the job he was holding when he transferred to Firth-Loach Metals

★ ★ ★

Manager of Research and Development: William C. Seitz. He joined Firth Sterling's Powdered Metals Production Division in 1935, being transferred to the Research Department in 1938. In 1940 he was promoted to Supervisor of Carbide Research and then to Assistant Manager of Research in 1951, in which work he was engaged when he became a member of the staff of Firth-Loach Metals. Inc.

Named President Of Pennsalt's Industrial Chemicals Division

William P. Drake has been named President of the new Industrial Chemicals Division of the **Pennsylvania Salt Manufacturing Company,** it was announced by **George B. Beitzel,** President of the consolidated company.

★ ★ ★

In his new capacity Mr. Drake will be responsible for both the manufacture and sale of Pennsalt's extensive line of industrial chemicals. Other major operating divisions of the consolidated company are the Chemical Specialties Division; the Pennsylvania Salt Manufacturing Company of Washington; Sharples Chemicals, Incorporated; and the Pennsalt International Corporation.

Celanese Executives Promoted

J. J. MacFarland has been promoted to the newly created post of Assistant to the General Manager of the Plastics Division of **Celanese Corporation of America.** Mr. MacFarland joined the Company in 1947, and a short time later was made Manager of the Product Development Department of the Chemical Division.

★ ★ ★

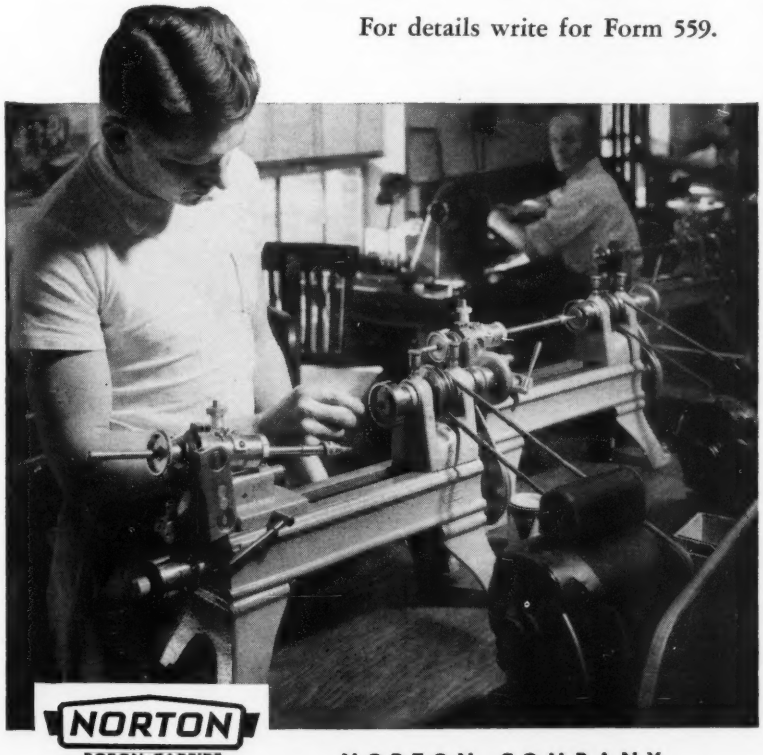
He is succeeded in his old position by **David D. Hecht,** formerly Director of the Application Laboratory, Summit, N. J.

★ ★ ★

Save Money with NORBIDE® Abrasive . . .

Are you still using costly diamond dust for refinishing your wire drawing dies? Many wire mills are saving money by using NORBIDE Abrasive for ripping or fast stock removal as well as for accurate semi-finishing operations.

For details write for Form 559.



NORTON
BORON CARBIDE

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NORBIDE® . . . *the hardest man-made abrasive*

Roetting Acquires Wire Machinery Corporation

The Wire Machinery Corporation of America, New Haven 9, Conn., has been acquired and incorporated by **A. J. Roetting,** who had been Works Manager, in active charge of contracts, manufacturing and sales for many years, when the company was operated under the individual proprietorship of **John P. Barclay.** The new corporation will operate the business under the same name, with Mr. Roetting as President, Treasurer and General Manager.

Mr. Roetting looks forward to giving their machinery customers the same skillful attention that the company has devoted to them throughout its more than thirty-five years of uninterrupted service in the manufacture of stranders, closers, insulating equipment, wire drawing machines, galvanizing and tinning equipment and special machinery.

Appointed Sales Manager of Davis-Standard

The Davis-Standard Sales Corporation, Mystic, Conn., has announced the appointment of **Kenneth Vandenbree** as Sales Manager of the company, with whom he had been connected for a number of years previously. Due to his wide experience in all phases of rubber and plastics extrusion, the company feels that it is now in a position to render even better service to its many customers.

★ ★ ★

This company is the sole selling agent for **The Standard Machinery Company** of the same city, manufacturers of extruding machinery for rubber and plastics, molding presses and other equipment for the rubber and plastics industry.

WIRE SPOOLS, ALL-STEEL, LITHOGRAPHED

Ends and traverses may be shipped separately and assembled easily in your plant on a hand, foot, or power press.
5" and 6½" diameter ends with 1-15/16" diameter traverses.
10½" diameter ends with 3½" diameter traverses.
Traverse lengths up to 12".

J. L. CLARK MANUFACTURING CO.
600 23rd AVENUE • ROCKFORD, ILLINOIS

C. F. & I. Veteran Honored

H. R. Merriam, who has been with the **Colorado Fuel and Iron Corporation** for fifty years, was honored at a 50th Anniversary party tendered to him by his associates at the Athens Athletic Club in Athens, California, on May 7th.

H. R. Merriam

Bob Merriam started with the company in May, 1904, in San Francisco. He has held several positions, starting in the Accounting Department and rising to Sales Manager of the California Wire Cloth Corporation in 1924. He held this post until 1946, when the Wickwire Spencer Steel Company became a division of C. F. & I., at which time he was made Sales Manager of C. F. & I's., Hardware Products Department of the Pacific Coast Division. This is still the job in which he is active in selling wire and wire product items to the job-

bing trade.

★ ★ ★

At the company party, attended by the top executives of the concern, he was presented with many gifts, including a gold, diamond studded 50-year pin and a scrolled 50-year certificate signed by President A. F. Franz.

★ ★ ★

Mr. Merriam is one of the most loved, honored and respected steel men on the Pacific Coast.

Biskeborn Joins Ansonia

The Ansonia Wire & Cable Company has announced that beginning May 17, 1954, Hugo W. Biskeborn has joined the engineering and production staff of the company. **Alden P. Lunt,** President of Ansonia, said that Mr. Biskeborn will initially assume the duties of Methods and Planning Engineer and will be located at the main office of the company at 63 Main Street, Ansonia, Conn. Mr. Biskeborn comes to the company with many years of engineering and research background in the nonferrous metals and insulated wire and cable field.

J. P. Smith

J. P. Smith, Chief Engineer of the **Copperweld Steel Company,** Glassport, Pa., passed away on the first day of January of this year.

A S & W Districts Exchange Sales Managers

In a move to round out the experience of top sales personnel, **John Graham,** general manager of sales of **American Steel & Wire Division** of **United States Steel Corporation,** announced an exchange of managers between the New York District sales office and the Chicago District sales office. Coming to the Chicago District sales office as manager is **William W. Deal,** who is filling the position vacated by **Fred L. Nonnenmacher,** who goes to New York to take Mr. Deal's post as district manager of sales. Both men have been with the company for many years.

American Wheelabrator Makes Personnel Changes

American Wheelabrator & Equipment Corp., Mishawaka, Indiana, manufacturers of blast cleaning machines and dust and fume control equipment, has made promotions in and additions to its field sales and service personnel.

★ ★ ★

In the company's Detroit office, **William A. Illsley** was promoted to District Sales Engineer. He formerly served as Sales Engineer in the company's home office. In the Springfield, Massachusetts office, **W. J. Sutherland** was promoted to the post of District Sales Engineer. He formerly was Service Engineer in that office. **John H. Burlingame** has been appointed to that office as Service Engineer.

★ ★ ★

In the company's Cleveland office, **C. J. Osborn** was promoted to District Sales Engineer, having formerly been District Service Engineer in that office. **Dean T. Pournaras** was appointed to that office as the new District Service Engineer.

★ ★ ★

John J. Savignac has been ap-

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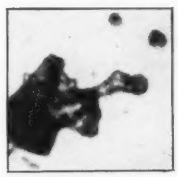
The finest always costs a little more

One carat of diamond powder may contain over a million diamond particles. Only ONE oversize particle in that million will cause a scratch, the removal of which is costly.



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DIADUST*, made by a special process, reduces this danger to a minimum. DIADUST is checked against rigid standards of purity, quality, and uniformity. Only then is it approved for your use.

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pointed to the firm's Milwaukee office as a District Service Engineer. In the Indiana office, at Mishawaka, Indiana, **Robert E. Gallatin** was appointed District Sales Engineer. **Harold Groh** was made District Service Engineer to succeed District Service Engineer **Bruce Berger,** who has been promoted to the home office engineering department.

To Manage Garfield Wire

Eric B. T. Kindquist, former wire mill superintendent and assistant works manager for the **Eastwood Nealley Corp.,** Belleville, N. J., has been appointed vice-president and general manager of the **Garfield Wire Division** of the **Overlakes Corp.,** at Garfield, N. J. Mr. Kindquist began his metallurgical career in the research laboratory of the International Nickel Co. at Bayonne, N. J., later becoming research engineer for the R.C.A. Mfg. Co. at Harrison, N. J. For several years he was associated with Battelle Memorial Institute, Columbus, Ohio, as a research engineer specializing in the physical metallurgy of nonferrous metals.

Carpenter Appoints Sales Manager

Omar V. Greene has been appointed general sales manager of the **Carpenter Steel Co.,** Reading, Pa. Mr. Greene was formerly New England manager for the company with headquarters in Hartford, Conn.

★ ★ ★

He joined Carpenter in 1928 as a metallurgist and in 1940 became manager of tool and alloy steel sales. Prior to his New England appointment, Mr. Greene was assistant general sales manager and manager of product development.

Metallurgist Re-Joins Makepeace

E. A. Capillon, after five years with the **J. L. Anthony Co.,** Providence, R. I., has returned as metallurgist to the **D. E. Makepeace Co.,** Attleboro, Mass. Prior to joining the J. L. Anthony Co., Mr. Capillon was connected with his present company 22 years, which is a division of the Union Plate & Wire Co.

Research Director Appointed

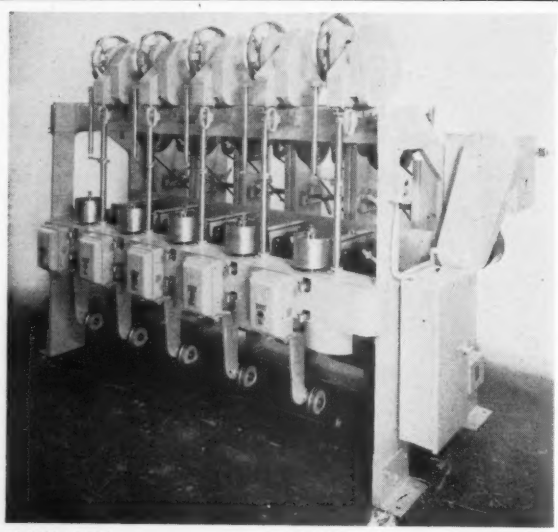
C. Dean Starr has resigned from the research staff at the University of California, Berkeley, to assume the position of research director for the **Wilbur B. Driver Co.,** Newark, N. J.

Norton Personnel Changes

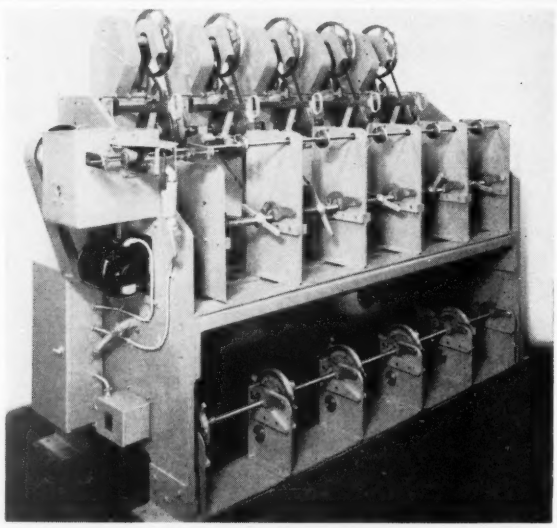
Hugh T. Price, Jr. was made factory manager of **Norton Company's** Grinding Machine Division on April 9th replacing **Iver G. Freeman,** who became a vice president of **Reed-Prentice Corporation** on May 1st. Mr. Freeman has been in Norton's Grinding Machine Division 38 years.

★ ★ ★

Roland T. Nelson replaces Mr. Price as production manager, while **Oscar A. Erickson** takes over Mr. Nelson's job as planning engineer.



FRONT VIEW



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#2S-5-MBB INSULATION WINDING MACHINE

APPLIES SINGLE COVER TO 5 LINES OF WIRE SIMULTANEOUSLY. NOMINAL WIRE RANGE #15 TO #25 B & S GAUGES (.057" TO .018" OR 1.450 TO .455MM). STANDARD CAPSTANS 8" DIAMETER, BUT MACHINE ILLUSTRATED IS SPECIALLY ARRANGED WITH 12" DIAMETER CAPSTANS, IN PLACE OF STANDARD 8", FOR HEAVIER WIRES. SUPPLY WIRE LET-OFFS AND TAKE-UPS ARE AT REAR OF MACHINE.

Booklet on Use of Hardsurfacing Welding Rod

Coast Metals, Inc., Little Ferry, N. J., has issued a folder describing the characteristics and applications of their #170 weld rod for hardsurfacing. It is a thin-walled tube electrode containing molybdenum, boron and iron.

★ ★ ★

Its use on mild steel and cast iron are described, with a tabulation of recommended applications. Copies will be sent you upon request.

Elected Vice-President of Loewy Rolling Mill Division

The election of **Hermann A. Bottenhorn,** Rolling Mill Chief Engineer of **Hydropress, Inc.,** New York, as Vice-President in Charge of its Rolling Mill Division has been announced by Erwin Loewy, President. Bottenhorn, who joined Loewy-Hydropress in 1946, has been connected with the Loewy Group for 30 years.

New Fatty Acid Announced

The Swift & Company Industrial Oils department has announced production of a new highly distilled fractionated fatty acid to be known as Oleic Acid No. 905.

★ ★ ★

Developed for use where high acid number, low titer and color clarity are necessary, the product has exceptional color clarity and stability, officials said. The product has been made possible by new manufacturing processes which allow for more selective extraction of color bodies and unsaponifiable material.

★ ★ ★

Specifications are similar to that of a high grade red oil: Titer—5 max.; FFA (as oleic) 98-102; Acid No. 195-204; Iodine No. 90-96; Sap. No. 198-204; unsaponifiable 1.0% max.; Lovibond (5¼" col.) 10 Y/1.0 R. max.

★ ★ ★

For further information write Swift & Company, Industrial Oils Department, 1838 - 165th St., Hammond, Indiana.

Develops New Skidproof Floor Surfacing

The Corrosion Engineering Products Department of the **Pennsylvania Salt Manufacturing Co.,** Widener Bldg., Philadelphia 7, Pa., has announced the development of "Neofloor," an air-curing liquid for wood, concrete, steel or other materials to provide a safe nonskid surface for floors and stairs in plants.

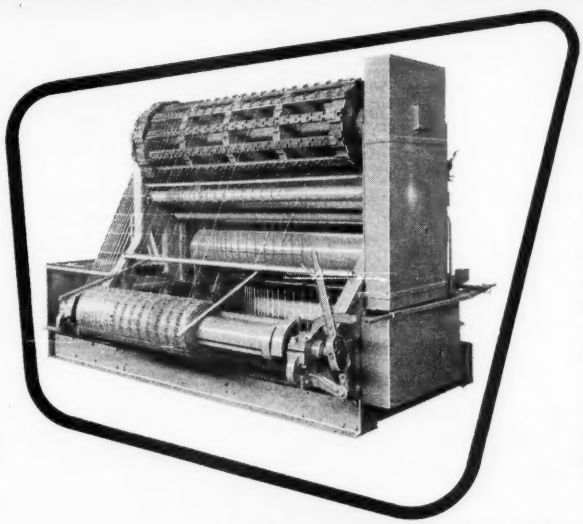
★ ★ ★

Neofloor is a resilient neoprene coating in which an abrasive grit is firmly anchored. It can be applied with a brush or other applicator and sets over-night. It is said to provide a safe and durable footing around machines or other hazardous places.

★ ★ ★

Product Data Sheet #CP-599 gives complete details for its application and of its qualities and specifications. You are invited to write the company for a copy.

Interlocking FENCE LOOMS



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- Replaceable Main Bearings
- Single or Double Strands
- Years of Low Cost Production

Write for Detailed Information — Without Obligation

Interlocking Fence Co., Box 8, Morton, Ill.

Specialists In Fence Looms

A Review of Recent Wire Patents

No. 2,677,398, MACHINE FOR CRIMPING WIRE FOR SPRING WIRE STRINGERS AND FOR FORMING LOOP SPRINGS ON THE ENDS OF THE WIRES, patented May 4, 1954, by John E. Medendorp, Muskegon, Mich., assignor to Stubnitz-Greene, Spring Corporation, Adrian, Mich, a corporation of Michigan.

An automatic machine is disclosed to form stringers or wire beams with depressions or crimps pressed into the wires and the wires folded back at the ends to form a loop at one end and a safety-pin spring at the other end of the wire beam.

★ ★ ★

No. 2,677,624, METHOD OF ENAMELING SHEETS, patented May 4, 1954, by Joseph C. Eckel and Harold F. Miller, Pittsburgh, Pa., assignors to United States Steel Corporation, a corporation of New Jersey.

A method of making enameled articles is disclosed comprising alloying .05 to .10% phosphorus with .03% maximum carbon steel, cold rolling bands of the steel to the desired gauge, box annealing the bands at a temperature between 1550 and 1650° F., cutting the bands into sheets, forming the sheets into the desired form, coating the formed articles with enamel frit and firing the coated articles to fuse the frit.

★ ★ ★

No. 2,677,625, FLAT ROLLED FERROUS METAL FOR VITREOUS ENAMELING, patented May 4, 1954, by Joseph C. Eckel, Pittsburgh, Pa., assignor to United States Steel Corporation, a corporation of New Jersey.

The method of preventing reboiling of enameling stock during firing of enamel coatings thereon, the stock comprising enameling stock of low-carbon undeoxidized steel is disclosed in this patent.

★ ★ ★

No. 2,678,171, COIL WINDING MACHINE, patented May 11, 1954, by John Henry George Critch, London, England, assignor to International Standard Electric Corporation, New York, N. Y., a corporation of Delaware.

A machine for winding toroidal coils on a coil core is disclosed, comprising a revolving shuttle in the form of a unitary ring, a bobbin, the ring having a cavity therein adapted to receive the bobbin, and ring having a single break therein at the cavity and being of resilient material adapted to be spread at the break to enable slipping the core on to the ring and to enable the bobbin to be inserted into and withdrawn from the cavity, the ring having sufficient resilience to return to its normal shape upon release of tension thereon.

★ ★ ★

No. 2,678,808, SINUOUS WIRE STRUCTURAL AND HEAT EXCHANGE ELEMENT AND ASSEMBLY, patented May 18, 1954, by John R. Gier, Jr., Hudson, Ohio.

The sinuous wire elements are brazed or electrically welded between thin metal strips and the latter, in turn, brazed to or between plates.

★ ★ ★

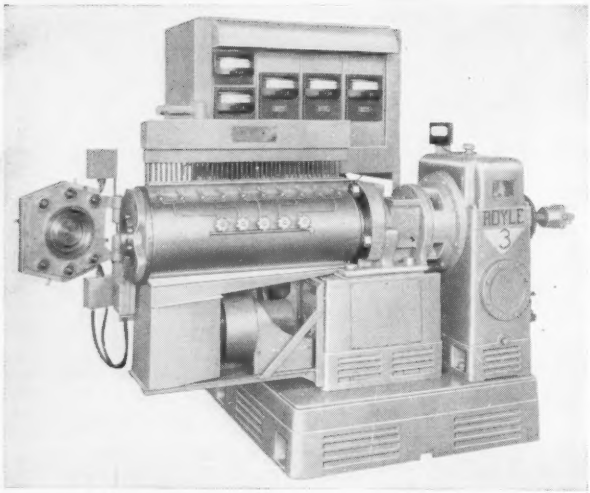
No. 2,678,988, HEAT-TREATING MECHANISM FOR COIL SPRINGS, patented May 18, 1954, by Martin J. Nelson, Chicago, and Clifford E. Ives, Wilmette, Ill., assignors to Wunderlich Spring Machinery Company, a corporation of Illinois.

There are seventeen claims to this apparatus which is stated to be useful with the coil spring producing machine of patent No. 2,604,202, issued July 22, 1952.

★ ★ ★

The information in this section is furnished by the patent law offices of LANCASTER, ALLWINE & ROMMEL, 438 Bowen Bldg., Washington 5, D. C. Data listed is only a brief review of recently issued patents obtained by various U. S. Pat. Off. registered attorney for manufacturers and/or inventors. Complete copies may be obtained direct from Lancaster, Allwine & Rommel by sending 50¢ for each patent desired. Outside of the U. S. and Canada the cost is $1.00 for each copy.

FASTEST HEATING FASTEST COOLING



Here are some of the time-tested, money-saving reasons more and more plants are standardizing with Royle Spirod* Extruders for processes requiring maximum flexibility in controlled temperatures — constantly maintained and accurately zoned:

- **Extra heavy walled cast steel cylinders that will not warp. No joints to leak when pressures are high or crevices to collect burned compound that would cause contamination.**
- **Heavy duty large diameter heating elements, that can be used with 440 volts without step-down transformers, provide radiant heat to cylinders and heads.**
- **Any heating element may be removed and replaced without disturbing other elements or wiring.**
- **A cooling system with ten times the capacity of conventional designs can be modulated through its entire temperature range without drastic changes. Ample cooling for all compounds at maximum speeds.**

No. 3 Royle Spirod Extruder. Completely insulated and equipped for evaporative cooling.

*Patent Applied For

JOHN ROYLE & SONS

ROYLE PATERSON N. J. 1880

PIONEERED THE CONTINUOUS EXTRUSION PROCESS IN

London, England — James Day (Machinery) Ltd. — REgent 2430
Home Office — V. M. Hovey J. W. VanRiper — SHerwood 2-8262
Akron, Ohio — J. C. Clinefelter — SWandale 4-5020
Los Angeles, Cal. — H. M. Royal, Inc. — LOgan 3261

PATERSON 3, NEW JERSEY

No. 2,678,989, HEAT-TREATING MECHANISM FOR COIL SPRING, patented May 18, 1954, by Martin J. Nelson and Edward Turecki, Chicago, Ill., assignors to Wunderlich Spring Machinery Company, a corporation of Illinois.

This is a modification of the apparatus disclosed in patent 2,678,988. There are seven claims.

★ ★ ★

No. 2,678,993, WOVEN RESISTANCE OF HEATER DEVICE, patented May 18, 1954, by Gerard W. de Boer, Madison, Conn.

A woven resistance unit is disclosed comprising warp strands of insulating material and a continuous filling of resistance wire, the filling comprising a number of continuous spaced wires having intermediate portions laid in the warp across one end of the unit in parallel relation and the remaining portions of the resistance wires which are connected to each end of the intermediate portions being woven alternately back and forth across the unit in nested parallel relation to one another.

★ ★ ★

No. 2,679,368, WIRE NETTING, patented May 25, 1954, by Herbert Aigner, Vienna, Austria, assignor to Hutter & Schrantz Aktiengesellschaft Siebwarenund Filztuch-Fabriken, Vienna, Austria, a firm.

This wire netting comprises adjacent wires which are of flattened cross-section throughout their length and tightly twisted together along longitudinally spaced-apart stretches evenly distributed along their length to provide nonhinging, rigid joints at the twisted-together stretches.

★ ★ ★

No. 2,679,475, METAL BLACKENING COMPOSITION AND METHOD, patented May 25, 1954, by Joseph C. Singler, Cleveland, Ohio.

A process of blackening a metal surface of steel, brass, copper, aluminum, nickel or cadmium is described, comprising immersing the metal surface in a water bath consisting essentially of per gallon of water about 8 oz. nickel chloride; about 4 oz. of ammonium chloride; about 1 oz. of Rochelle salt; about ¾ oz. of zinc chloride; about 2 oz. of sodium chloride; and about ¼ oz. of ammonium molybdate; and passing a low voltage electrical current therethrough with the metal as the cathode.

(*Continued from page 767*)

so minimizing the temperatures and pressures within the die.

★ ★ ★

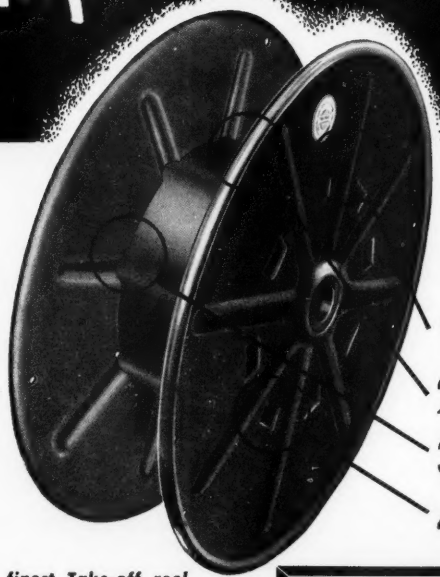
42. **When** misalignment exists the presence of a sull or phosphate coating does not prevent excessive die wear, which is caused by the rapid formation of a partial wear ring. Any advantage which may be obtained from the use of a drawing coat must arise from the fact that when the outer lime-soap skin breaks down there still remains the soap impregnated coat to prevent the metal to metal contact which would otherwise occur. The ability of a sull or phosphate coat to resist breakdown as the wear ring deepens and stresses increase will vary, but can only delay for a short period the scraping of the wire. Under ideal conditions the lime-soap skin formed at the roughing pass suffers no deterioration whatever after a further seven or nine passes.

★ ★ ★

43. **The** effect of misalignment of the ingoing wire on the physical properties of the drawn wire should also be considered; as the angle of contact between the wire and the die wall is increased the reduction takes place over a smaller area of the die surface—consequently the distortion of the crystal structure of the steel will be greater on one side of the wire

Important DIFFERENCES

BETWEEN JUST ANY REEL AND All Welded MPS



TAKE-OFF REELS

Three important differences that mean longer reel life in both processing and handling of all types of insulated wires in your plant.

1 New MPS **deep wide, straight type embossed radial rib** adds considerable strength to reel heads over the old style narrow tapered rib.

2 **Increased height of the curled edge** adds even more strength and rigidity, especially to the rims.

3 Furnished with **rib fillers** that are projections on the end of the barrels that fit into the embossed radial ribs thereby **eliminating any marking of the plastic or rubber insulated wires** at the junction of head-barrel.

4 Finally, the **all welded "J" type construction** of the entire reel completes the picture.

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We invite your inquiries — let us tell you more about MPS Take-off Reels. Write us today.

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#109

TABLE 4.

Die Number	Tonnage Drawn at .125"/.131"	Tonnage Drawn at .154"/.158"
1	81 Tons	49 Tons
2	97 Tons	139 Tons
3	84 Tons	74 Tons
4	53 Tons	51 Tons
5	188 Tons	----

OUTPUT OF SQUARE DIES AT

ROUGHING AND FINISHING PASS

DRAWING 5g .08/.12%C. Rod. CONDITION - UNCOATED.

than on the other. The effect of this must tend to produce both uneven structure and temper in the wire, so reducing its ductility; it is reasonable to suppose, however, that with correct alignment of ingoing wire the uniform reduction would have a beneficial effect on the quality of the finished product.

★ ★ ★

44. **In** normal production runs it has been proved conclusively that, with the formation and retention of the heaviest possible lubricating skin, perfect alignment of the ingoing wire produces the slightest and most uniform drawing ring; little imagination is required to appreciate the resultant saving in die cost per ton of wire drawn and consequent higher machine output.

★ ★ ★

45. **Misalignment** of outgoing wire for the purpose of casting has shown no marked detrimental effect on die wear.

★ ★ ★

46. **The** drawing tests described were conducted at speeds appreciably below those in operation in many works to-day; increased speeds will create higher temperatures within the dies but providing the increased temperature can be dissipated by efficient cooling of the dies and the wire, and providing the lubricant will withstand the higher temperature, there would still appear to be no necessity for special coatings.

★ ★ ★

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The ***POURTIER*** *High-Speed*

INDIVIDUAL INSULATING MACHINES

INDIVIDUAL HEAD, handling wire sizes of 7 to 32 A.W.G. Other models made with up to four (4) serving bowls.

POURTIER MACHINES will serve cotton, paper, cambric, fiberglas, silk, nylon and cellulose acetate at speeds of 4500 r.p.m.

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Machines are built to meet AMERICAN STANDARDS

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POURTIER MACHINES

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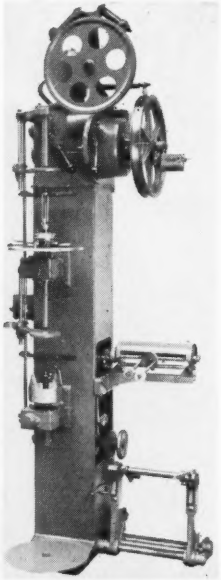


INSULATING MACHINE IM 402

For the U. S. exclusively for I. M. Machines, address inquiries to FIDELITY MACHINE CO., Inc. Philadelphia, Pa.

For other machinery, send inquiries to POURTIER MACHINES. See address at left.

47. **The** preparation of this Paper was prompted by the growing demand for improved coating media for the purpose of minimizing die wear; the Author sincerely hopes that the methods and results described may be of some assistance by encouraging a new approach to the real principles which are involved in the efficient production of dry drawn ferrous wire.

★ ★ ★

The Author wishes to thank The Standard Wire Company for their permission to make public the methods described in this Paper.

The Desired Electrical Qualities of High Voltage Cable Paper

(*Continued from page* 755)

the size of conductor, as in Dr. Whitehead's laboratory samples, the stress on the oil is practically uniform throughout the thickness of insulation and the Whitehead effect, failure of the oil, occurs throughout the cable. Where, however, the insulation is comparatively thick, as in a high voltage cable, an ordinary test voltage will ionize and impair only the inner layers of oil and the surrounding layers of un-ionized insulation will resist breakdown better, the higher the density of the paper.

★ ★ ★

Therefore, the final result is that to obtain high dielectric strength for low voltage cables, (where it is not needed), use low density paper, but for high voltage cables, use high density paper.

★ ★ ★

There is, unfortunately, a gap in our knowledge of the relation of density to the electrical properties of impregnated paper. Three properties are desirable:

1. **High dielectric strength.**
2. **Low permittivity, so as to impose a minimum stress on oil films.**
3. **Low power factor.**

★ ★ ★

These three properties are probably functions of several variables in the manufacture of paper, among which are, undoubtedly, the following:

1. **The degree of beating.**
2. **The density of the deposit of fibers.**
3. **The degree of surface calendering.**

★ ★ ★

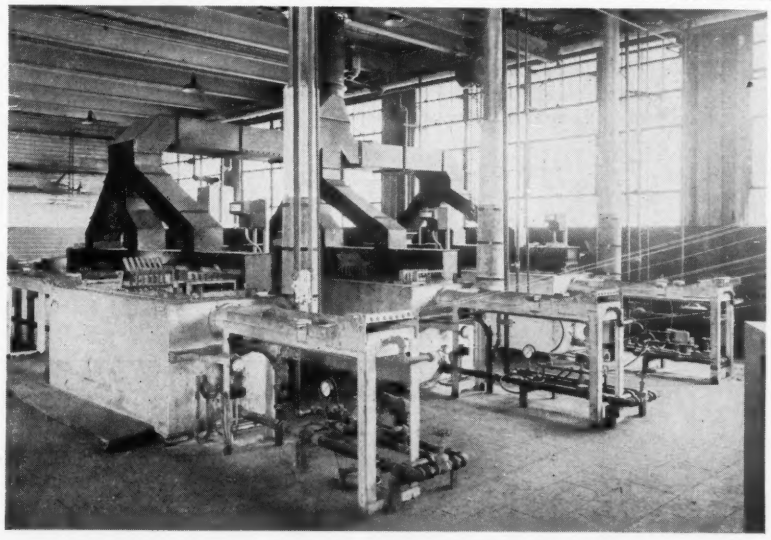
It is probable that either increasing or decreasing any one of these variables will influence one or other of the electrical characteristics beneficially and, at the same time, be a detriment to the others. We thus have one of those situations with which our sciences are continually confronted, which calls for cooperative research. We are willing to do our part.

★ ★ ★

An important paper by **P. Cloke** and **K. K. Khandelwal** appeared in **COMMUNICATIONS AND ELECTRONICS,** 1952, No. 3, p. 309, in which the authors tell of testing papers of equal specific gravities but different air resistances and obtaining the relation between dielectric strength and air resistance. They found a rising dielectric strength with increasing air resistance, thus proving the importance of air resistance or Gurley density regardless of specific gravity, for obtaining high dielectric strength.

Grading by Density

The Germans were so completely sold on the value of high density paper that they even patented the



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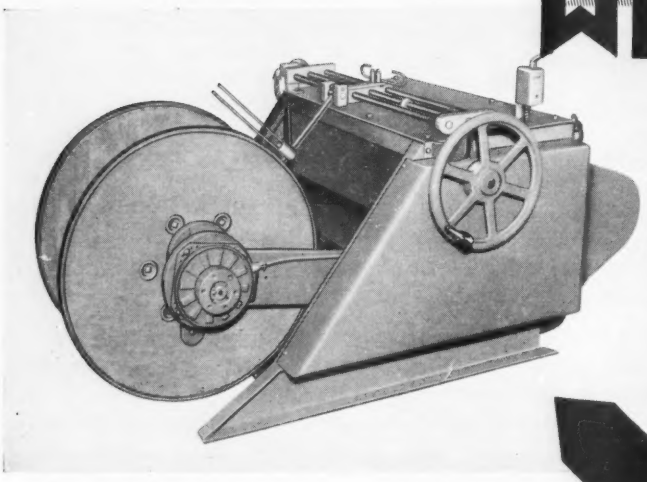

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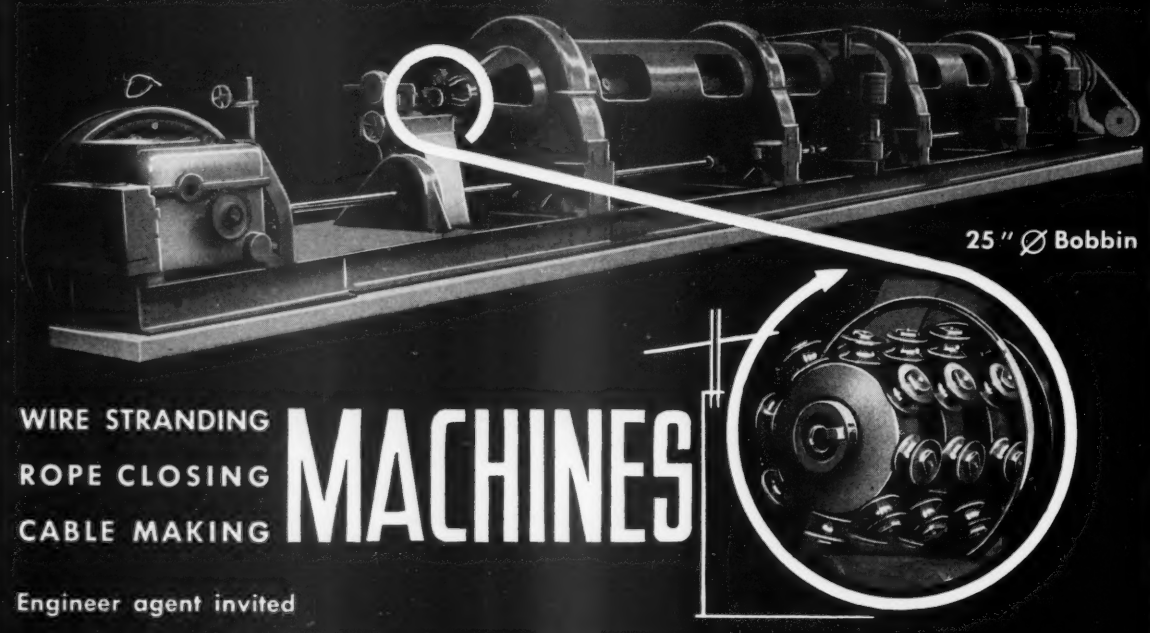
NIEHAUS High-Speed Tubular Stranding Machine



WIRE STRANDING
ROPE CLOSING
CABLE MAKING

MACHINES

Engineer agent invited

MASCHINENFABRIK K. A. NIEHAUS · GERMANY
DÜSSELDORF-RATH

use of special paper of very high specific weight. They also patented a cable in which the paper was graded by density, i.e., having high density paper at the conductor and low density paper at the sheath, with, if desired, papers of intermediate density between them.

★ ★ ★

Test of solid type cables, at the Habirshaw Laboratories, made with two grades of paper of widely different densities, arranged as specified in the patent, failed to show the expected advantage. The reason was found with the aid of a device for measuring tape tensions in a finished cable and later confirmed by polystyrene embedded wafers of thin cable cross sections which showed a paper-free region at the junction of the two grades of paper.[1] It was surmised either that the more dense paper had shrunk in drying or that the paper of lower density had less elastic stretch in being applied on the cable. This suggested the idea of trying the papers in reverse, i.e., the low density papers near the conductor and the denser papers outside. This made no appreciable difference in the 60 cycle dielectric strength, but showed far greater stability of power factor on load cycle tests. The reason for this effect on power factor is, in large measure, the absence of the ionizable paper-free region mentioned. However, other factors also enter.[2]

★ ★ ★

This proved to be of importance in the design of solid type cables but of no value in ionization-free cables, such as the oil-filled and various forms of pressure cables. In these, it was found that a few layers of very high density papers (about 4000 Gurley) at the conductor, greatly increased the impulse dielectric strength.

(1) "The Mechanical Uniformity of Paper Insulated Cables," by K. S. Wyatt, D. L. Smart, and J. M. Reynar, Trans. AIEE 1938, Vol. 57, pp. 141-154. (The Insulation Compactness Tester is made by the Central Scientific Co. of Chicago).

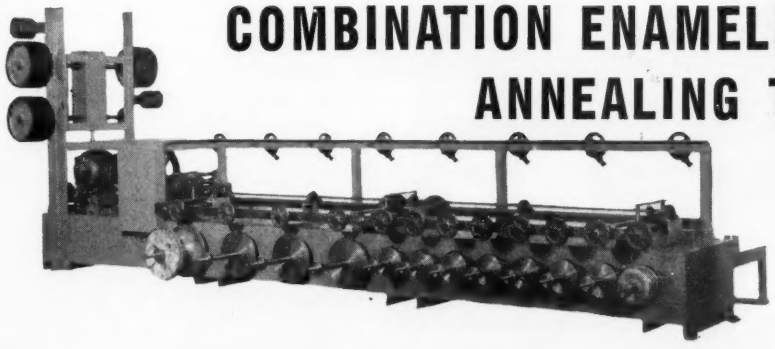
(2) "A New Principle of Cable Design," by W. A. Del Mar, Trans. AIEE 1941, Vol. 60, pp. 206-210, and p. 713.

Grading by Thickness

Examination of polystyrene-embedded wafer-tin sections of cables showed that the tapes crossed over the underlying gaps between tape edges without dipping into them. It was therefore evident that any air or oil films therein would be of exactly the same thickness as the tapes. As the dielectric strength (volts per mil) of an air or oil film is greater the thinner the film, cable failures always start with deterioration of such films, and it was therefore obvious that the deterioration voltage of a cable could be increased by using thinner paper. As this would greatly increase costs if carried throughout a cable, it was found that the same result could be obtained by grading the paper by thickness, i.e., using the thinnest paper near the conductor, where the stress at working voltage is greatest, and increasingly thicker paper as the stress falls off with distance from the conductor. This construction is used in high pressure gas-filled cables and in extra high voltage

A New and Efficient • • •

COMBINATION ENAMELING AND ANNEALING TAKE-UP



FEATURES

- Built specifically for Teflon and Kel-F coating and dipping processes.
- Has variable speed range ratio of 3 to 1, or speeds of from 3 to 300 ft. per minute.

Versatile—can also be used as annealing furnace take-up.

Reel sizes: 4 heads 6″ x 12″ with 1¼″ arbor bore and 8 heads with 3″ x 6″ reels with ⅝″ arbor bore. Size of reel arbor bores optional. Handles wire in gauges ranging from #8 down to #36, B&S.

Built-in let-off for heavy gauges with ball-bearing shafts for 8″ x 12″ or 12″ x 18″ reels. Equipped with single power take-off capstan and double capstan power take-up.

ALSO: Special machinery for strand annealing, tinning units, gang winders, wire drawing machines, re-spoolers, die making machinery for polishing and lapping, wire strand retipping machine, and enameling equipment.

WOODSIDE WIRE CORPORATION • GREENWOOD AVENUE WORTENDYKE, NEW JERSEY

cables to good advantage, the thinnest paper being usually 1-½ mils thick.

★ ★ ★

The same idea was applied by Domenach and Macardier, in France, to oil-filled cables, but they carried their experiments a step further than their predecessors by using narrow tapes of linen paper 0.7 mils thick. When such cables were taken apart, tape by tape, it was found that, unlike cables hitherto made, the tapes did not bridge the gaps between tape edges, but drooped into them, substantially filling them and thereby eliminating the oil films almost entirely. This happened because the very thin paper was made of pliable linen stock instead of the comparatively stiff wood pulp.

★ ★ ★

We would like to have an American paper which will perform this function as well as the French linen paper which we have to import.

Paper for Extra High Voltage Cables

The dielectric loss in a high voltage cable occurs partly in the paper and partly in the oil. That which occurs in the paper is due, principally, to the presence of electrolytes which were either originally in the pulp or were introduced by the washing water.

★ ★ ★

The power factor of insulation, which is the quality that measures the energy lost in it due to alternating electric stress, also determines the temperature rise of the paper due to electric stress alone and apart from the temperature rise to which it may be subjected by the heating of the conductor by current. The total temperature rise of the insulation is the sum of these two rises; and as the total is fixed by the limitations of the cable materials, an excessive dielectric loss implies a reduced I^2R loss in the conductor and, therefore, less current.

★ ★ ★

An insulation power factor of 0.3 or 0.35 per cent, as ordinarily obtained with present day impregnated paper, does not seriously lower the ampacity (i.e., the current carrying capacity) of cables up to 138 kv. However, at 230 kv. it begins to pinch, and at 350 kv. and over it is so serious that cables for such voltages are seldom economically practicable for transmission over a distance, although entirely practicable for short runs, such as between transformers and aerial lines, where convenience rather than economy is the dominant factor. Such cables are in successful use in Sweden, where they are now operating at 425 kv.

★ ★ ★

It may be possible to attain lowerdielectric losses with present paper by using some kind of synthetic oil having a power factor lower than that now attainable in mineral oil, but there is danger in this, at very high voltages, for the simple reason that stability of the synthetic oils under stress is less known than it is for mineral oil.

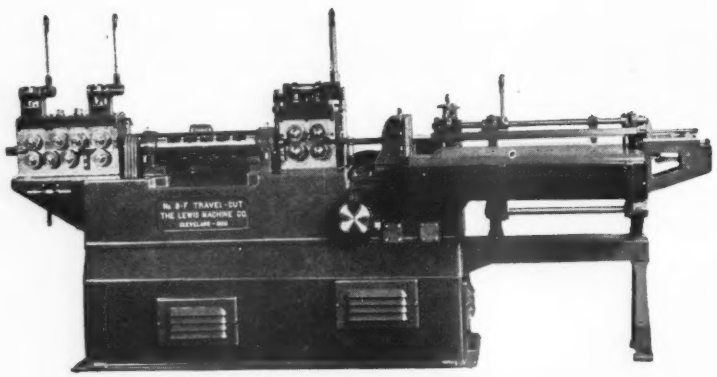
★ ★ ★

In my opinion, lower dielectric losses must come, in principal measure, by better paper. On the other hand, low specific gravity would probably give low permittivity, so that this would suggest the desirability of paper of low specific gravity and high air re-

Fast, Accurate, Economical

STRAIGHTENING and CUTTING

with LEWIS TRAVEL-CUT



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sistance. Such paper, impregnated, would probably have lower power factor. The practical difficulty in improving paper is the expense of obtaining large quantities of water free of electrolytes. The available paper of lowest power factor is that made in the springtime, when the river freshets come from melted snow. Later in the season, the river waters have accumulated from ground seepage and have picked up the baneful electrolytes from the soil. We may have to go to Switzerland or Italy for our paper, as in those countries snow water is available the year around, not far from industrial centers.

★ ★ ★

Collaboration of the American paper makers with electrochemists might be fruitful in solving this problem. Perhaps they could use economical methods of ion exchange to de-ionize the water.

★ ★ ★

In the meanwhile, we are planning to reactivate our laboratory paper "machine" to ascertain the ultimate possibility in low power factor, with present day pulp, using water of controlled conductivity and electrolyte content.

Impressions of the U. S.

(*Continued from page* 761)

It is necessary that the increase in productivity which is the only rational and durable solution for an improvement of living standards and social peace, should be sought on a broader plane by all men of good will in all walks of life. The members of the Steel Wire Drawing Team have it at heart to bring their contribution to this general task.

Fastener Concern Appoints Executives

Gray Screw & Bolt Division, Chicago, **Pittsburgh Screw & Bolt Corp.,** has appointed **Robert G. Roy** general manager, **Robert Lowery,** III assistant general manager, **W. N. Hoelzel** general manager of sales and **John C. Jewett** assistant general manager-sales.

Wire Man Makes Gift to Australian Institution

Word has been received from far-off Australia that **Sir Frank Beaurepaire,** Chairman of the Board of **Olympic Cables Ptg. Ltd.,** Victoria, Australia, has made a handsome gift of what would be about $500,000.00 in our currency to the University of Melbourne.

★ ★ ★

The gift is to be used by the University for the development of sports and physical education, in the interest of helping to develop better men physically as well as building character and leadership. Sir Frank has been vitally interested in athletics, having been a champion swimmer himself and established fourteen records in various parts of the world.

★ ★ ★

Sir Frank, who is well-known abroad in the wire and cable industry, founded his present company during World War II, and has provided thousands of miles of electric cable for the allied forces in the Pacific.

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Only ½ the Weight!

Light Weight
Precision built
Reduced cost
Longer life
Extra strength
Dynamic balance
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ACROPAK Spools will help you cut wire packaging costs because they give longer service, require less maintenance and cost less to ship. They're strong. They'll take repeated shippings and still run true on the arbor. They're machined to close tolerances. You can run them at high production speeds with fewer snags, less toe-out and minimum end breakage.

THEY CUT YOUR SPOOLING COSTS

Best proof of ACROPAK superior performance are the millions of these spools now used by the biggest names in the wire industry. We've proved it to them—let us prove it to YOU.

★ We also make a complete line of heavy-duty shop processing STEEL SPOOLS built to the same high standards of accuracy and rigidity as the famous Acropak aluminum spools.

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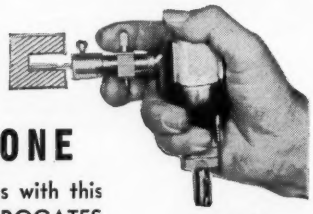

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and perform innumerable other functions with this new work reducing tool that RECIPROCATES OSCILLATES or ROTATES when spindle attachment is used.

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Furnished complete with universal motor and flexible shaft drive, ready for immediate repair use on round, flat or shaped dies, will even make new dies from carbide after center hole is drilled. Does in minutes what would normally take hours and enables you to repair dies, often without even removing them.

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WAFIOS

WIRE-WORKING MACHINERY

Wire Netting Machines for Chain Link, Hexagonal Mesh, Poultry Netting, Field Fence. Crimping, Barb Wire and Staple Machines. Spring Coilers. Spring End Grinding Automatics. Loop Benders. Upholstery Spring and Wire Mattress Machines. Wire Nail Machinery. Chain Formers. Chain Welders. Straightening and Cutting Machines. Multi-Slide Wire and Strip Forming Machines. Special Machinery for the making of Paper Clips, Lock Washers, Bale Ties, Key Rings, Tin Openers, Wire Bag Ties, etc. Automatics for Flexible Metallic Tubing.

Sole Agents:
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WAFIOS

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Veteran Sheet and Tube Man Retires

B. M. Stubblefield, for the last seven years manager of Chicago district operations for **The Youngstown Sheet and Tube Company,** has announced plans for retiring from active service May 1st. He will continue with the company on a consulting basis.

★ ★ ★

Mr. Stubblefield joined The Youngstown Sheet and Tube Company in 1916 and spent 31 years in the Youngstown district before coming here in 1947 as district manager.

★ ★ ★

During his service here Youngstown inaugurated, and has practically completed, an expansion program which increased capacity sharply and boosted the payroll from 7,500 to around 9,000 employees.

Appointed to Top Engineering Jobs by Surface Combustion

Carroll Cone has been appointed Chief Engineer of the Industrial Divisions and **William H. Dailey** has been appointed Chief Engineer of the Steel Mill Division of **Surface Combustion Corporation,** according to an announcement by **W. M. Hepburn,** Vice President in Charge of Engineering.

★ ★ ★

A graduate of Hamline University of St. Paul, Minnesota, Mr. Cone has been associated with Surface Combustion since 1930. Mr. Cone started at Surface Combustion as a development draftsman and worked up to various engineering capacities to the position of Chief Engineer of the Steel Mill Division, which he held prior to his appointment as Chief Engineer of the Industrial Divisions.

★ ★ ★

Mr. Dailey is a graduate of Rensselaer Polytechnic Institute, New York. Since joining Surface Combustion in 1948, Mr. Dailey has served in various engineering capacities, most recently as Staff Engineer of the Steel Mill Division.

To Head New Division for Lindberg

R. A. (Buck) Hastings, formerly Vice President of **Continental Industrial Engineers, Inc.,** has become associated with **Lindberg Engineering Company,** Chicago, Ill. Mr. Hastings will head up the sales department of a new division of the Lindberg Engineering Company, details of which will be announced later.

★ ★ ★

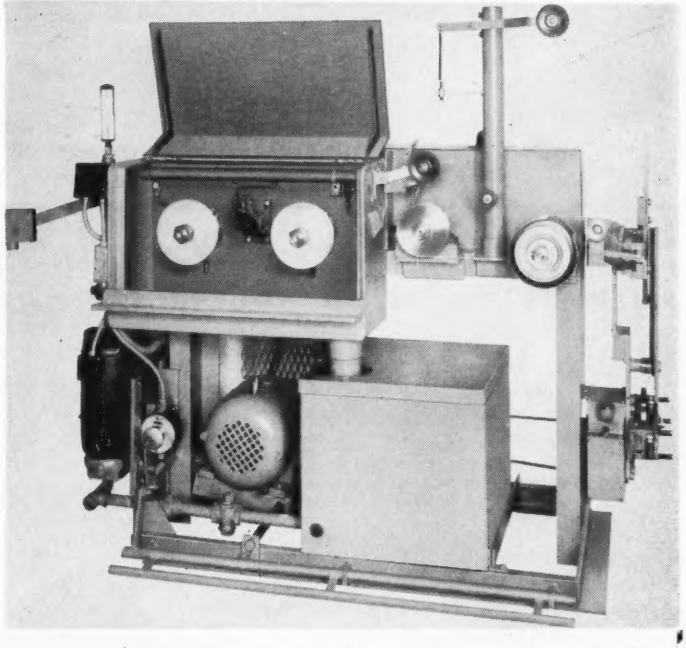
Mr. Hastings received his engineering education at the University of Iowa, and has 19 years experience in the erected industrial furnace field.

Joins Acheson Industries

Howard A. Acheson, Jr., has joined the staff of **Acheson Industries, Inc.,** as assistant to **Raymond Szymanowitz,** Executive Vice President. Mr. Acheson will be located at the company's Newark, N. J., offices.

draw wire *FINE* with Cook's "A-9"

this all new, fine wire-drawing machine is fast!



LOOK TO COOK—*for pace-setting advances!*

• NEW TYPE SPOOLER • DIRECT COUPLING • 9 DIES ON "A-9" • OCCUPIES LITTLE SPACE (2½' x 4') • SIMPLE TO OPERATE • FINISH SIZES: 34 B&S GAUGE TO 43 B&S GAUGE, @ 3000 F.P.M. • REEL CAPACITY: 5 LB. OR 10 LB. COPPER SPOOL • LOW COST

Prompt Delivery

Write or phone for construction and performance details

COOK MANUFACTURING COMPANY

50 E. 25th Street, Paterson, N. J. **Armory 4-6380 or 6381**

KAY & WARREN CO.

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Telephones: EVergreen 3-5514 & 3-5560

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of
INDUSTRIAL DIAMOND POWDERS

FROM USED WHEELS • HONES • SLUDGES
• COTTON WIPINGS • WIRE DIE POWDERS

ALL POWDERS CLEANED, ASSAYED AND GRADED TO MICRON SIZES.

Write or call for additional information

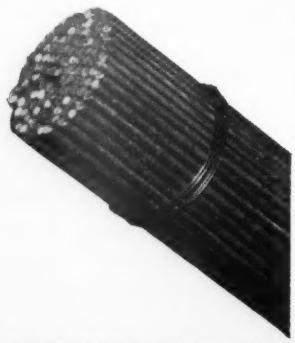
finish · temper · gauge · length

SHIPPED TO YOUR SPECIFICATIONS...

CALWICO

STRAIGHTENED AND CUT WIRE

Applicable to a wide variety of end uses, CALWICO Straightened and Cut Wire is your best buy. For complete information mail the coupon below.



The Colorado Fuel and Iron Corporation
Pacific Coast Division
1080 19th Avenue
Oakland 4, California

Please send data on CF&I Straightened and Cut Wire.

Name_____

Address_____

Use_____ General Specifications_____

THE COLORADO FUEL AND IRON CORPORATION • Denver, Colorado
PACIFIC COAST DIVISION • Oakland, California

CALWICO STRAIGHTENED & CUT WIRE
THE COLORADO FUEL AND IRON CORPORATION CF&I

After graduation from Cornell University in 1951 with a B.Ch.E., Mr. Acheson became associated with Esso Standard Oil Company at its Bayway Refinery. Following a tour of duty with the U. S. Army in the United States and Korea as a 1st Lieutenant, Ordnance, he returned to Esso for a year prior to joining Acheson.

Oakite Appointments

Oakite Products, Inc., manufacturers of industrial cleaning and metal finishing materials, have announced the assignment of the following new technical service representatives.

★ ★ ★

Malcolm N. Gray, to the Lincoln, Nebraska, area; **John N. Lee,** Miami, Florida; **Kenneth L. Oliver,** Fort Wayne, Indiana; **Thomas D. Ellsworth,** Grand Rapids, Michigan; **D. O. Mundale,** Asheville, N. C.; **Haskell Wilder,** La Crosse, Wisconsin; **Lloyd W. Kagley,** Knoxville, Tenn.; **William D. Hudson,** Topeka; Kansas; and **Henry W. Dieter,** Youngstown, Ohio.

★ ★ ★

The new representatives completed an intensive, eight-week training course at the company's New York headquarters and in the field before taking up their new assignments.

Celanese Appointments

Dr. William L. Evers and **Dr. O. V. Luke** have been promoted to new positions with **Celanese Corporation of America.**

★ ★ ★

Dr. Evers, who has been Assistant Manager of the Summit, New Jersey, Research Laboratories in Charge of Plastics Division Research, has been named Assistant to the Technical Director of the Plastics Division with offices in Newark, New Jersey.

★ ★ ★

Dr. Luke, formerly Chief Physical Chemist of the Clarkwood, Texas, petroleum chemical laboratory, will succeed Dr. Evers as Assistant Manager in Charge of

STANNOUS SULFATE

Saves Tin!

in liquor finishing operations

because

M & T Stannous Sulfate — a manufactured chemical — saves tin by doing away with many of the inefficiencies which accompany the treating of feather or flake tin to produce stannous sulfate on the job.

More convenient to use, too!

Baths are operable as soon as materials are dissolved. Solutions can be prepared in advance to produce desired colors and coating thicknesses.

AND, additions are made from stock solutions, assuring quick, complete mixing—eliminating any possibility of materials only partially dissolving in the bath—reducing the chances of miscalculating quantities of materials added.

Use M & T Stannous Sulfate for white or straw-color finishes. Write for technical procedure sheet.

METAL & THERMIT CORPORATION
Chemical Division
100 E. 42nd St., New York 17, N. Y.
Specialists in Tin and Tin Chemicals

Plastics Division Research at Summit, New Jersey.

★ ★ ★

Richard J. Savage has been named Director of Sales of the Marco Products Department of the Plastics Division of Celanese Corporation of America. He was formerly Director of Product Application of the department.

Made Midwestern Sales Manager by G.E.

Fred M. Pugh has been appointed Manager of the Midwestern Sales District of the **General Electric Company's** Silicone Products Department, it has been announced by Department Sales Manager **Robert J. Baumann.**

★ ★ ★

He joined General Electric as a test engineer at the Schenectady Works in 1947. In 1948, he was assigned to G. E.'s Chemical Division as a sales engineer. He has had posts in silicone sales engineering at the Cincinnati office, and in silicone sales development at the Department's Waterford, N. Y. plant. Since early 1953, he has been in the Cleveland, Ohio, office.

★ ★ ★

In his present assignment as Midwestern Sales District manager, Mr. Pugh will be located at 1105 Chester Avenue, Cleveland. Silicone sales representatives with offices in Cleveland, Detroit, Chicago and Cincinnati will report to him.

Sheffield Steel Man Heads WRI

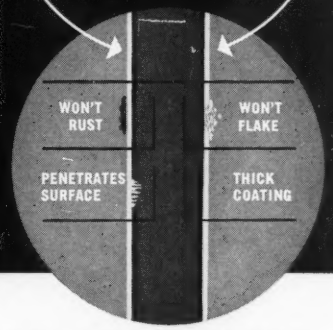
Walter H. Leo, Manager of Sales, Construction Products, of **Sheffield Steel Corporation,** Kansas City, Mo., has been elected president of **Wire Reinforcement Institute, Inc.,** at the Institute's annual spring meeting.

★ ★ ★

In 1929, after attending the University of Missouri, Mr. Leo began his career in the steel business and became associated with Sheffield in 1941, and served in several capacities, including district managerships in Dallas and St. Louis.

Here's why you should coat high and low carbon steel rod with

BORAX 5 MOL.



No Dust... For a cleaner shop—pleasant working conditions and easier house keeping. Borax-coated rod does not dust or flake, can be held in storage longer and is pleasanter to handle.

No Baking... The Borax solution penetrates the porous surface of the metal, neutralizing deepseated acid, and eliminating the need for baking.

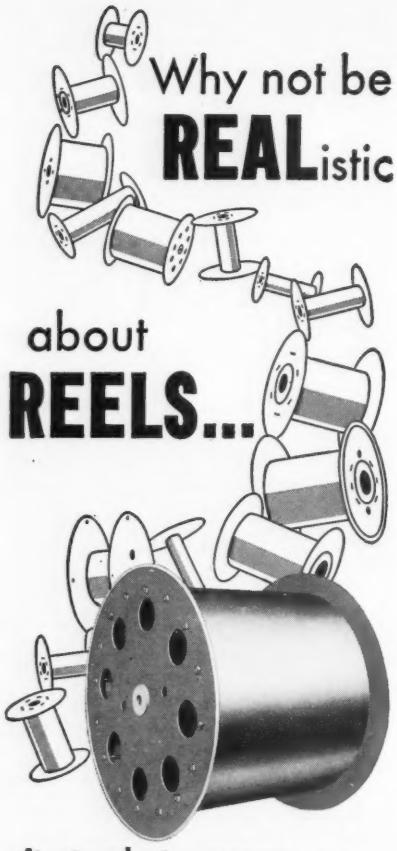
Longer Storage... The continuous film of Borax inhibits the formation of rust for a considerable period—particularly important where several days may elapse between coating and drawing.

Economical... A single dip in the Borax bath provides a thick durable coating which is very valuable where the wire is to be drawn in several stages.

Write to our Technical Department for further information.

PACIFIC COAST BORAX CO.
DIVISION OF BORAX CONSOLIDATED, LIMITED
NEW YORK • CHICAGO
LOS ANGELES • CLEVELAND
PHILADELPHIA

MANUFACTURERS OF FAMOUS "20 MULE TEAM" PACKAGE PRODUCTS



Why not be **REAL**istic about **REELS...**

It stands to reason that a company that's been doing a specialty job for more than 50 years really has the hang of it.

Apco Mossberg Company, for over a half century, has been everlastingly at the job of providing manufacturers of copper wire, steel wire and wire rope with all types and sizes of high quality steel reels, spools and bobbins.

Apco trained engineers consider each and every inquiry regarding steel spools, reels or bobbins separately . . . give individual attention to the design and construction to make certain that customers' requirements are carried out to the letter.

Reels are available in all sizes and shapes . . . for all applications. Write for further details today.

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The original Frank Mossberg Company

APCO MOSSBERG COMPANY
ATTLEBORO, MASS.

As president of the Wire Reinforcement Institute, a trade association with headquarters in Washington, D. C., he will preside over a program aimed at broadening the uses of welded wire fabric and improving the ultimate product it reinforces — highways, buildings, and concrete pipe. The Institute sponsors research activities and furnishes both general and specific information to engineers, architects, and builders.

Macwhyte Elect Directors

The annual meeting of the stockholders of **Macwhyte Company** was held on April 27th at the company's general offices in Kenosha.

★ ★ ★

Re-elected to the Board of Directors were the following: **George C. Wilder**—President of Macwhyte Company, **R. P. Tyler**—Vice President in Charge of Sales, Macwhyte Co., **E. C. Berg**—Vice President and Controller, Macwhyte Co., **Goodwin Johnston** — Treasurer, Macwhyte Co., **M. A. Buntrock**—Secretary, Macwhyte Co., **R. B. Whyte** — Consultant, Macwhyte Co., and **James T. Wilson**—Chairman of the Board, First National Bank of Kenosha.

★ ★ ★

At a meeting of the Board of Directors, immediately following the annual meeting of stockholders, the following officers were reappointed: **George C. Wilder**—President, **R. P. Tyler**—Vice President in Charles of Sales, **E. C. Berg**—Vice President and Controller, **Goodwin Johnston**—Treasurer and Assistant Secretary and **M. A. Buntrock**—Secretary and Assistant Treasurer.

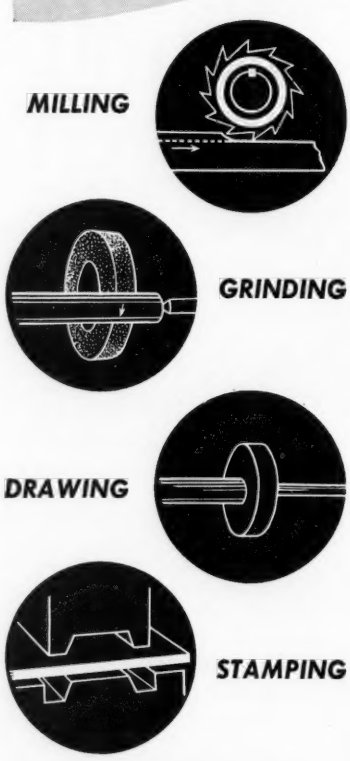
Handy and Harman Elect Officials

Richard G. Jones was elected to the board of directors and **Frank H. Wemple** was elected treasurer at the annual meeting of **Handy & Harman,** refiners and fabricators of silver, gold, and their alloys.

★ ★ ★

Mr. Jones is secretary and controller of the company, which he joined in July, 1945, after ten

4 places to cut costs with Hans C. Bick Lubricants



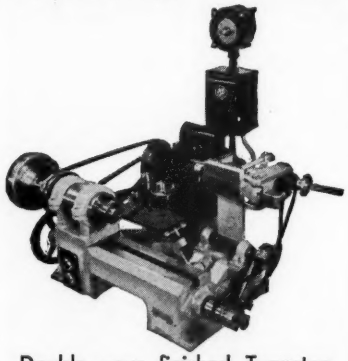
Take up your lubricant problem with Hans C. Bick and discover how you can reduce costs through increased production and longer life for tools, dies, and abrasives. Bick lubricants and coolants are modern compounds developed by specialists with 23 years' experience. To assure best results, our engineering service is always available to work with you in a friendly, cooperative way. If you machine, form, or grind ferrous and non-ferrous metals, call upon Hans C. Bick now to smooth the way for lower unit costs.

Hans C. Bick INC.
READING, PENNSYLVANIA

CUT
Die Room
COSTS
50%
with the New
type "M"

DYKREX
"IT CORRECTS THE DIE"

automatic
Polishing Machine



Double your finished Tungsten Carbide Die production

•

Save ½ labor costs—

•

The new automatic polisher with the Time Switch—

•

It is completely assembled—just plug it in!

ROOS TOOL & MFG. DIVISION
Dykrex Corporation of America
manufacturers of
Wire Die Finishing Machinery
33 Bloomfield Avenue
Newark 4, N. J.

Western Union
Teletype Service
QAB-WUX—Montclair, N. J.

The Standard of the Wire Industry

years with the United States Steel Corporation. He is also a director and secretary of **Handy & Harman of Canada, Ltd.**

★ ★ ★

Mr. Wemple, who has been assistant secretary and the head of the company's Trading Department, succeeds **Howard W. Boynton,** who is continuing as vice president. He came to Handy & Harman in December, 1945 immediately following service in the United States Navy.

Announces Four Managerial Appointments In Midwest

Four Midwest District and Branch Managers have been appointed by **The Carpenter Steel Company** of Reading, Pa., according to **H. Sturgis Potter,** Vice President.

★ ★ ★

William J. Ervin, Sr., has been promoted to District Manager of the Indianapolis territory and the Southwest with headquarters in Indianapolis. He was formerly Branch Manager of Carpenter's Indianapolis Mill Branch Warehouse.

★ ★ ★

Paul Holtz is now Assistant Chicago District Manager, and assumes the additional responsibilities for sales and service in the St. Louis area. Before his promotion, Holtz was Branch Manager of the Chicago Mill Branch Warehouse. He will continue to maintain headquarters in Chicago.

★ ★ ★

William J. Stephens has been advanced from Assistant Manager to Branch Manager of Carpenter's St. Louis Mill Branch Warehouse. Both Stephens and Holtz will work under the supervision of **L. E. Cooney,** the Company's Chicago District Manager.

★ ★ ★

William C. Kunkelman has been named Southeastern Manager in charge of sales and service in the Atlantic, Cincinnati and Dayton territories with headquarters in Cincinnati. He was former Branch Manager of the Company's Cincinnati Mill Branch Warehouse.

H-D

BUNCHING
(TWISTING)
AND
STRANDING
IN THE WIRE AND
GENERAL MANUFACTURING
PROCESSES

SPECIALIZED
ENGINEERING
AND
SPECIALIZED
FACILITIES
AT YOUR SERVICE

Expanding application of twisting principles to the production of many products is reflected by an ever-increasing demand for both H-D standard equipment as well as machines especially engineered to solve varied production problems. Week after week surprising new uses are developed through the close cooperation of our engineering department with manufacturers in many fields.

Write today for our New Technical Bulletins. Tell us what you make—or contemplate making and your inquiry will receive prompt attention.

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MACHINE CO., INC.
2231 E. ONTARIO ST.
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MASON STYLE
NON-RETURNABLE
METAL SPOOLS
PLAIN COATED OR
LITHOGRAPHED TO
YOUR SPECIFICATIONS
SIZES 5" DIA. FLANGE
6 ½" DIA. FLANGE
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LOW COST
— MASS PRODUCED BY MODERN METHODS
— WE DO OUR OWN LITHOGRAPHY

QUALITY
— STURDY CONSTRUCTION
— CLOSE SUPERVISION OF LITHOGRAPHY

SERVICE
— THE BEST

WRITE TODAY TO
MASON CAN COMPANY
1949 Dexter Rd., E. Providence 14, R.I.
MASON CAN COMPANY OF OHIO
Greenville, Ohio

All four appointments are in line with a redrawing of territorial boundaries made necessary by the retirement of **K. L. Crickman**, Regional Manager, who formerly supervised this entire area. Crickman, who maintained headquarters in Indianapolis, had been with Carpenter for 26 years. He retired on June 30th.

AS&W Appoints Credit Manager

The appointment of **William E. Riddiford** to the post of credit manager of the Central District of **American Steel & Wire** has been announced by **Walter V. Farr,** treasurer of this division of **United States Steel Corp.**

★ ★ ★

He was employed with several Chicago companies before joining the Corporation's United States Steel Supply Division as district accounting supervisor on the comptroller's staff in 1942. In 1946 he was transferred to the organization planning division of the Wire Division's accounting department where he became a supervisor a year later. In 1953 he moved to the treasury department as an assistant credit manager, which position he has held until the present time.

★ ★ ★

In his new post, Mr. Riddiford will have charge of all of the customer accounts for the Wire Division in Ohio, Michigan, West Virginia, Western Pennsylvania, part of Kentucky, and the western tip of New York.

Pennsalt's Chemical Specialties Division Makes Personnel Changes

A. H. Clem, President of the Chemical Specialties Division of the **Pennslyvania Salt Manufacturing Company,** has announced that **Alfred H. Pope,** formerly a member of the Technical Department staff, has been named Product Supervisor for Pennsalt's metal cleaners and will be replaced by **William T. West** of the Metal Processing Department.

★ ★ ★

In his new position Mr. Pope will be responsible for the Company's sales and service activities

WHAT'S IN A SLOW BURN?

There's more to a slow burn than just temper.

When radio or TV hook-up wires get crossed, there may not always be sparks but there's a lot of heat generated — sometimes enough to start a good flame on the insulation.

When this sort of thing happens, the flame can be retarded and even extinguished if a NELCO saturant has been used on the insulation. Our laboratories worked long and hard to discover just the right combination of materials that would give a fire-retardant saturant that would also meet all other requirements of the radio and TV hook-up wire people.

The NELCO saturant we have developed, besides its outstanding characteristic of being a fire-retardant, has many other fine qualities. For example:

Its lightness in color makes wire more attractive, more sellable.

Its resistance to discoloration means finished wire that will not fade or become untraceable.

Its quick-drying properties, essential in mass production operations, are unequalled.

Here is another NELCO saturant, specially developed to do a tough job . . . as are all our saturants and lacquers.

When you do a slow burn over inefficient saturants, write to us for help. We're used to finding just the right solution for other people's problems.

NEW ENGLAND LACQUER CO.
150 King Philip Rd., East Providence, R.I.

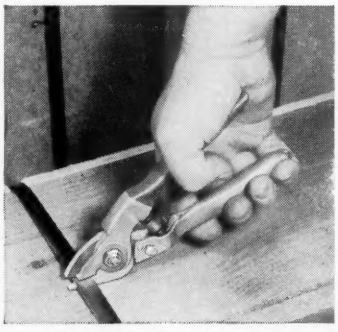
in the metal cleaners industry, in which he has had extensive experience. Mr. Pope is an alumnus of Pratt Institute where he majored in chemical engineering. He joined Pennsalt in 1943 as a member of its Research and Development staff.

★ ★ ★

Mr. West has been associated with the Company as representative for the New York area since 1951, and like his predecessor, is well known in the metal finishing field. As a member of the Technical Department staff he will be concerned with field and liaison work with the Research and Development Laboratories, manufacturing clients and sales staff.

New Time Saving Strap and Wire Cutter

The new Porter One-Hand 8T Cutter has been designed to meet all the requirements for cutting steel strapping and wire binding in shipping rooms.



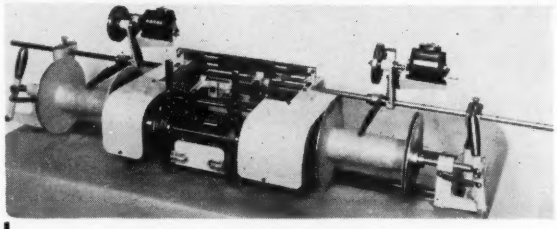
New Time Saving Strap and Wire Cutter

As a result, this cutter embodies many new features. For longer cutting life there are heat-treated blades. For hand comfort there are plastic cushion grips which prevent blisters and keep hands from slipping. For faster operation there is a spring which keeps tool open to cutting position and a thumb lock which keeps tool safely closed when not in use. It's light, yet powerful and compact.

★ ★ ★

The sharp pointed lower jaw fits easily under the tightest strapping or baling wire for quicker cutting and the thin, flat blade prevents damage to either con-

A NEW BENCH SPOOLER



Illustrated:
THE BOYD No. 6000 BENCH SPOOLER

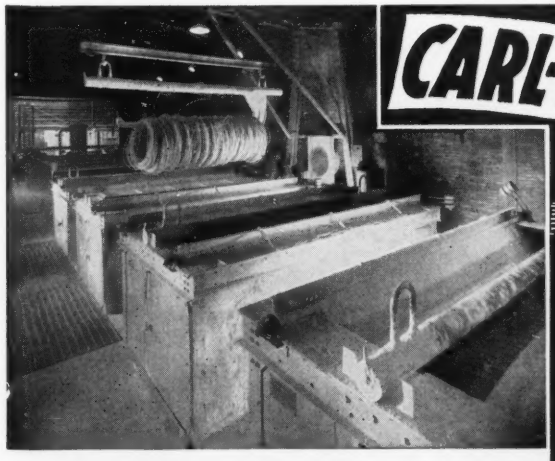
- **RUGGED PRECISION ENGINEERED SIMPLICITY**
- **CONSISTENTLY ACCURATE WINDING**
- **SUPERIOR PACKAGE APPEARANCE**
- **"DESIGNED TO LAST" CONSTRUCTION**

Available with one or two spindles having common traverse and individual drive for each spindle. The spindles are started independently by manual control and halted automatically by predetermining counters and solenoid action. Traverse rates and travel are easily and quickly changed to suit your needs. Screw reversing mechanism controlling traverse can be adapted to wire, tape, plastic, etc. as required.

Further particulars may be had upon request.

BOYD & SONS MANUFACTURING CORPORATION

1434-38 Callowhill Street **Philadelphia 30, Pa.**



CARL-MAYER

HI-SPEED REGISTERED

ROD BAKERS

PATENT Nos.
U.S.A.
2,296,361
2,323,828
CANADA
2,235,559
396,144
401,589

GREATER SPEED AND FUEL ECONOMY PROVES OUTSTANDING ENGINEERING

Carl-Mayer Hi-Speed Rod Bakers have an exclusive heating arrangement, combining faster baking with amazing fuel economy—and a patented Blow-Off feature which removes moisture without bumping or agitating the coils. *WRITE FOR BULLETIN NO. 350*

ALSO OTHER TYPES OF INDUSTRIAL OVENS AND FURNACES

SERVING CONCERNS LIKE THESE:

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Babcock & Wilcox
Canadian Steel Corporation.
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Eaton Manufacturing Co.
Frost Steel & Wire Co., Ltd.
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Hollup Corp.
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THE CARL-MAYER CORPORATION

3030 EUCLID AVENUE
CLEVELAND, OHIO

"ALBANY"
WIRE DRAWING
LUBRICANTS
FOR ALL TYPES OF FERROUS
AND NON-FERROUS METALS
WET OR DRY DRAW

Typical Wet Machine for Drawing Operation

You can improve your wire quality and increase your drawing efficiency by

USING "ALBANY" PRODUCTS

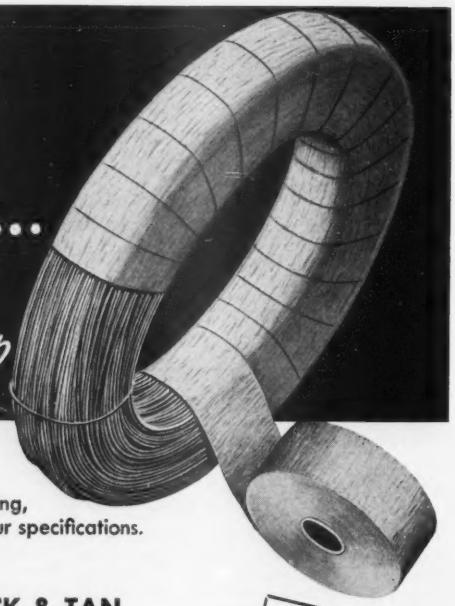
Our Engineers are prepared to assist you.

1868 — ADAM COOK'S SONS, INC. — 1954

LINDEN • NEW JERSEY

OTHER ALBANY PRODUCTS ARE DESIGNED FOR TUBE DRAWING
AND OTHER METAL WORKING OPERATIONS

for TIGHTER
ALL-ROUND
PROTECTION...
use NATCO
Spiral Wrap



Strong, with a built-in stretch, NATCO's contour-hugging spiral wrap is superior for wire coils, tubing, metal rods and bars. Made to your specifications.

- PLAIN • WAXED
- WATERPROOF • BLACK & TAN
- GREASEPROOF • REINFORCED
- ANY SIZE ROLL—*for machine or hand-wrapping*

Write today for sample rolls, prices and complete information.

NATIONAL WATERPROOF PAPERS, INC.
Manufacturers of Protective Papers, Liners and Bags Since 1903
108 Beckett Street, Camden 3, N. J.

Larmuth power wrapping machines or special tension and edge-folding attachments for your machines.

tainer or contents. A notch in the lower blade keeps round wire in position for cutting and a "keeper" makes sure that strapping or wire stays straight in the jaws when pre-cutting.

★ ★ ★

Write to **H. K. Porter, Inc.**, 74 Foley St., Somerville 43, Mass., manufacturers of metal cutters for seventy-five years, for information.

New Rectifier Announced

Kocour Selenium Rectifier Model 25A is a self-contained power supply. AC input 110 volts 60 cycles. DC output 6 volts, 25 amperes continuous duty ratings. Full wave

bridge type selenium rectifier stack . . . powerstat single knob continuously variable control over entire range. Thermoswitch protection against over-heating. No installation . . . no maintenance, ideal DC power supply for individual tank, small plating barrel, battery charging, research and control. Write for literature to **Kocour Co.**, 4809 S. St. Louis Ave., Chicago 32, Illinois.

Chase Opens New Warehouse in Los Angeles

Chase Brass & Copper Co., Inc., a subsidiary of Kennecott Copper Corporation, has completed its move into its new Los Angeles warehouse. The new facilities at 6500 East Washington Boulevard, with ample stocks of Chase products for serving customers in Southern California, involves an investment of more than $1 million.

★ ★ ★

The Los Angeles warehouse is one of 24 Chase full line warehouses across the nation, supplemented by three sales offices.

New Wide Fly Screen Loom Announced

The Mummert-Dixon Company, Hanover, Pa., has added to its line of fly screen looms a new 72″ loom. It is of heavier construction than the 36″, 48″ and 60″ looms, being mounted on their No. 360 hardware cloth loom.

★ ★ ★

Several new features have been added to this loom, among them an improved method of effecting wire tension control by means of a ratchet, instead of the usual weight and worm gear method. Another feature is a means of making speed changes by a mechanical control instead of replacing gears. Extension slides are also provided to support and guide the long shuttle bars. Standard warp drums are used, but these are so arranged that the drum may be wound in two sections.

★ ★ ★

Besides the fly screen looms in various widths, the company makes a complete line of looms for weaving hardware cloth and other industrial wire fabrics.

★ ★ ★

Descriptive literature describing this or other types of looms will be furnished by the Mummert-Dixon Company upon request.

Bulletin on Electric Wire Testers

A new bulletin has been issued by **Peschel Electronics, Inc.,** 13 Garden St., New Rochelle, N. Y., describing four types of testers manufactured by them.

These are:

Continuous insulation tests for magnet and other fine coated wires. It counts and records pinholes accurately at speeds up to 600 FPM.

Audiotone continuity and leakage tester. This device is for use of electrical men in making repairs, for production testing on fixtures and for laboratories whenever a wide range tester is required.

Sensitive Hipot tests to provide a positive indication of dielectric leakage without burning up fine equipment and components.

High voltage test sets operates on AC or DC current; is used for production testing of cable insulation, in places where more power than the Hipot testers is needed.

VINYLS for...

CRITICAL CUSTOMERS

For the past ten years we have specialized in the compounding of Vinyl extrusion and injection molding compounds to specifications, or developing compounds for a specific use.

Underwriters' approved standard compounds are available in all colors for POT, T, TW, 80 Degree C, 90 Degree C and 105 Degree C wires.

If you require a Vinyl compound rated higher than 105 degrees C for special applications, we suggest you communicate with us, as we may have a compound to meet your requirements.

Your inquiries are invited.

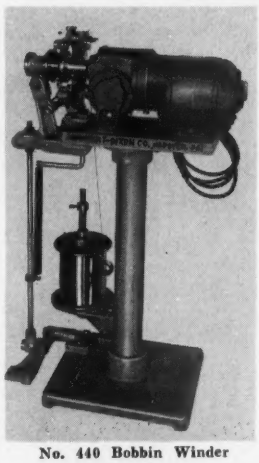
ELECTRONIC RUBBER COMPANY

69 Sunnyside Ave. • Stamford, Conn.

NEW SINGLE BOBBIN WINDER

No. 440 **FOR USE WITH**

M-D WIRE LOOMS

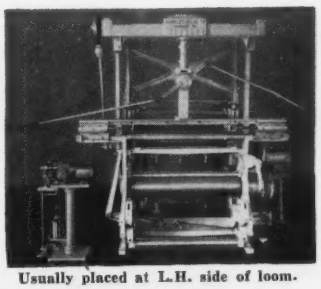


No. 440 Bobbin Winder

The winder shown at the left is designed to wind wire on bobbins as fast as the loom requires them. In fact, they will keep ahead of the loom's needs.

The winder is adjustable to bobbins of 3″ or 4″ in diameter and various widths of ½″ to 1¼″. Will wind a bobbin 3″ diam. x 1″ wide, of .011 wire in 8¼ minutes.

Traverse and wire guide are adjustable for any widths of movement desired. Will not pack wire so as to cause bobbin flange to bulge. The automatic stop is adjustable for any amount of fill required. The tail stock and other rollers have ball bearings.



Usually placed at L.H. side of loom.

The picture at the right shows the customary placement of the winder in juxtaposition with an M-D wire loom.

This small winder is carefully designed and made; needs only a minimum of attention.

Ask for descriptive circular No. 9953.

MUMMERT-DIXON CO. **HANOVER 3, PENNSYLVANIA**

HIGH QUALITY
COPPER and BRONZE WIRE
TINNED WIRE and L.A.C. WIRE

SPENCER WIRE CORPORATION

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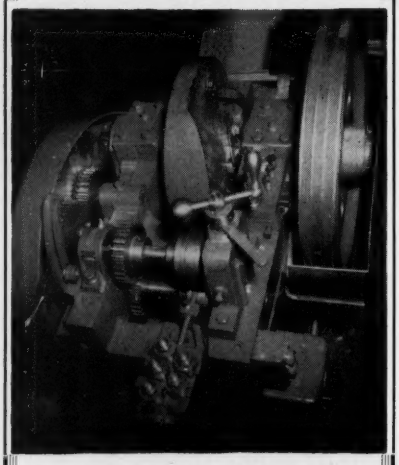
Plants at UNION, N. J. • Telephone: UNionville 2-7950

1000 STAPLES PER MINUTE!!!
are made on the
HUMPHREY STAPLE MACHINE



Top View, showing Fly Wheel & Gears

MAKES: FENCE Staples
Poultry Netting Staples
Double Pointed Tacks

48 different leg lengths
Gauges 8 through 18

Efficient, Compact
Easily Adjustable

Models: Belt or Motor Drive

Prompt Deliveries

For further information write

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CUT YOUR OPERATING COSTS
WITH HARDSURFACED:

Saves down time . . .
wire rejections . . .
increases production

VAUGHN HR BLOCKS

Hardsurfaced parts last
3 to 10 times as long as
standard equipment

DRAW BLOCKS
DRAW RINGS
CAPSTANS
PULL BLOCKS
SHEAVES
TABLE ROLLS
SHEAR BLADES
CRANE WHEELS
SHAFTING
and other
WEAR SURFACES

Write today for the facts

PARKWAY-KEW CORPORATION
P. O. Box 504 **Menlo Park, N. J.**

Telephone: MEtuchen 6-4747

Full details as to capacities, feature and applications are given for each type of tester. The bulletin will be mailed to interested parties on request to the company.

Parkway-Kew Opens New Plant

Parkway-Kew Company recently moved to its new and larger plant on Route 27 in Menlo Park, N. J.

★ ★ ★

As hardfacing specialists, the company both hardfaces wear surfaces of machinery on contract and manufactures hardsurfaced wire drawing equipment parts. They now have a complete machine shop with all equipment needed to perform any type of work in this nature.

★ ★ ★

Through their special process, such parts as shears, capstans, draw rings and blocks, hot cutting blades, etc., can be made to give many times the service of the older types of steel parts and accessories.

★ ★ ★

Besides repairing and rebuilding steel wear parts with hardfacing alloys, the company is manufacturing draw rings and capstans for a number of wire drawing machinery manufacturers for original equipment to be used in the drawing of steel, brass, copper and aluminum wire.

★ ★ ★

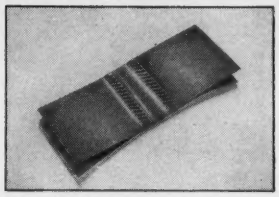
Eugene W. Klein and **H. Newman,** partners in the enterprise, manage the business.

★ ★ ★

Complete details on the cost of such operations will be furnished upon request.

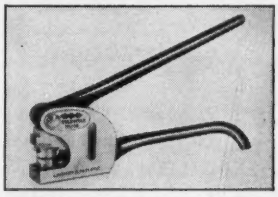
Wire Company Appoints Southern District Manager

N. P. Nordie, Sales Manager of the **Wilbur B. Driver Co.,** Newark, N. J., has announced the appointment of **Richard E. Swift** as Southern District Manager, with headquarters located in Louisville, Kentucky.



Samples of .004 aluminum foil Lapwelded by UTICA® Koldweld Tool KL-10. Straight tensile tests measure better than 60 lbs. on .004. In tear tensile tests, strength is in excess of 20 lbs.

Above is .030 aluminum sheet Lapwelded in flat strip, then bent, contorted and wrapped around 8X-type cable of about 4" diameter. Weld holds securely.



UTICA® KOLDWELDING Tool KL-10 for Lapwelding of aluminum foil and sheet or strip up to .040 or over all of .080.

NOW...

KOLDWELD ALUMINUM CABLE SHEATHING

Easily, quickly

without heat without solder without crimping

New UTICA® Lapweld Tool KL-10 Koldwelds by pressure alone, makes perfect welds with aluminum foil and aluminum sheet up to an over all thickness of .080.

UTICA® No. K-10 weighs only 2¾ lbs., is no bigger than a large pair of pliers, is easily portable and operates by hand pressure alone. Joints are stronger than those made by soldering, crimping or welding involving heat.

Utica's Koldweld engineering department will be glad to work with you to solve your problem. Write or phone, giving information as to type or types of aluminum sheathing you are working with as this will determine the type and size of die for the KL-10.

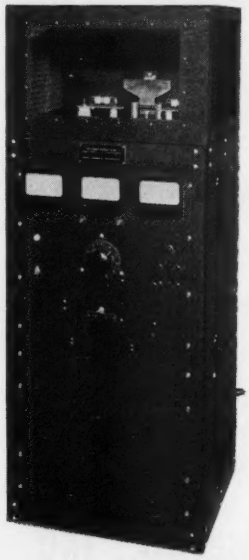
UTICA®

UTICA DROP FORGE & TOOL CORP.

KOLDWELD DEPT.

Utica 4, N. Y.

AC/DC HIGH POTENTIAL TEST SETS



- **High sensitivity circuit breaker, continuously adjustable.**
- **Non-destructive testing.**
- **Continuously adjustable output voltage, AC or DC.**
- **Voltmeters across output.**
- **Complete series—up to 100 KV units.**
- **Optional burn feature.**

OTHER PRODUCTS:

Continuous Insulation Testers for Magnet Wires.

SPARK TESTERS

SENSITIVE HIPOT TESTERS

Write for bulletin

PESCHEL ELECTRONICS, INC.

13 Garden Street **Tel: NE 6-3342** **New Rochelle, N. Y.**

JAEGER
Automatic Wire Weaving Looms

Other products we furnish:

Fourdrinier Looms

Semi-Automatic Looms

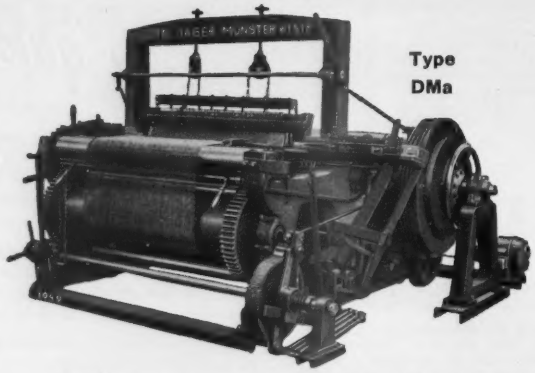
Mesh Assembling Looms

Automatic Pirn or Bobbin winders

Beaming Devices

Weaving Reeds

Wire Crimpers for wires up to 1/8" dia.



Type DMa

Weaving Range 1 to 20 mesh per inch with wires up to .100". When used semi-automatically, meshes with wires up to .240" dia. can be woven.

We have a complete line of Looms from the coarsest mesh up to 450 mesh per inch.

For further information write us giving details.

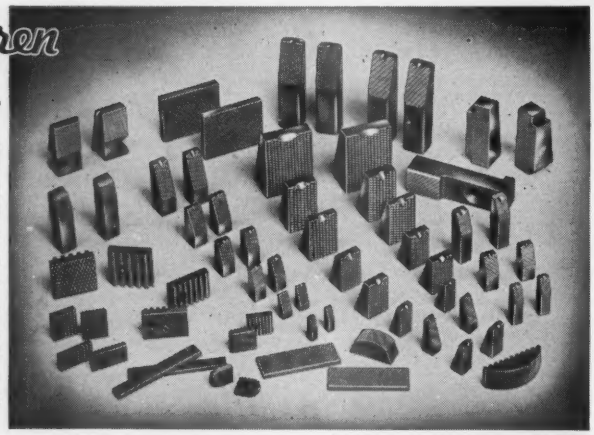
CEDAR WEST TOOL COMPANY, INC.

88-92 West Street, New York 6, N. Y.

Sjogren

JAWS....

for Wedge Grips, Pullers and Tensile Testing Machines of all makes are available either from stock or manufactured to order. A Sjogren jaw, made to meet your requirements, guarantees you service.



SINCE S&S 1927

Used by Wire Men Who Want the Best!

SJOGREN TOOL AND MACHINE CO., INC.

WIRE PULLERS • WEDGE GRIPS • JAWS FOR ALL MAKES OF PULLERS AND TESTING MACHINES • CAGE ROLLERS • SWAGING HAMMERS • POINTING DIES • WIRE SPOOLERS

14 SWORD STREET
AUBURN
MASSACHUSETTS

Company Handles Spring Tooling; Testers and Ovens

Alvar P. Johnson of the **Spring Manufacturers Supply Co.,** recently announced the formation of his company which handles products consisting of tools and equipment exclusively for the spring industry. Mr. Johnson reports that the carbide tools, manufactured by the Mill-All Co., are rapidly gaining recognition as the finest tools available for Torrington, Sleeper & Hartley and Samuel automatic spring coilers.

★ ★ ★

Other products are six types of spring testing machines which will test all types of springs regardless of type, size, or load, foot press tools of several kinds for looping or putting special shapes on spring ends, hand coilers for short orders, heat treating ovens and calculators for determining loads and stresses.

★ ★ ★

All products in the line are designed by spring manufacturers or spring engineers with long and varied experience in the field of spring making. Catalogs covering most items are available by writing to The Spring Manufacturers Supply Co., 95 Marion Ave., Plantsville, Conn.

Republic Wire Sales Up

Republic Steel Corporation's wire division doubled sales of finished wire products in the first quarter of this year over the last quarter of 1953.

★ ★ ★

J. P. Distler, manager of wire division sales, said that buying by farmers has been primarily responsible for the increased volume of business. Sales of woven and barbed wire fencing, nails and staples, baler wire and other farm products all are up.

★ ★ ★

Wire inventory in the hands of jobbers supplying the farm market is very low. Mr. Distler warned that some farmers might not be able to get satisfactory delivery because of the hand-to-mouth inventory distributors are carrying.

Industrial wire, which has been in the doldrums, is also showing signs of increased activity. Slackening of business in this line has been largely because of inventory correction. He expects increased industrial wire sales to balance any decline of a seasonal nature in farm sales.

★ ★ ★

Industrial wire has some 150,000 uses. Greatest use for the high carbon wire is in springs for furniture, beds and auto cushions. Low carbon wire is used in making many products, including such major ones as fasteners, stove and refrigerator racks and garment hangers.

New Development Unit Formed by G. E.

The establishment of a new Advance and Development Unit within the Engineering Section of the **General Electric Company's Silicone Products Department** at Waterford, N. Y. was announced by **Dr. Edward A. Kern,** manager —engineering for the department.

★ ★ ★

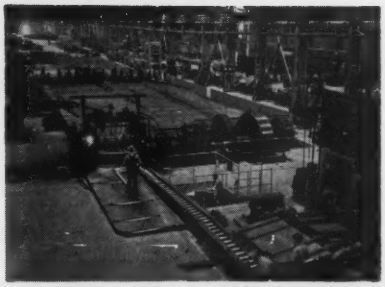
Dr. Robert O. Sauer was named manager of this unit, with the title of manager—advance and development engineering. He joined General Electric in 1940 as a research associate at the Research Laboratory in Schenectady. He was transferred to Waterford, N. Y., his present headquarters, in 1949. He is a native of Iowa and a graduate of Coe College with an A.B. degree in chemistry and physics. He received his doctor's degree in organic chemistry from the University.

Reynolds Increases Wire, Rod, Bar Capacity

A new merchant mill with capacity to produce 36 million pounds of aluminum merchant wire, rod and bar products annually has been completed at Sheffield, Ala., at a cost of approximately one and three-quarter million dollars, it is announced by **J. Louis Reynolds,** Reynolds Metals Company's vice president in charge of manufacturing. The facility is now in production and will be operated by **Reynolds Alloys Company,** a subsidiary of **Reynolds Metals Company.** It includes 130,000 square feet of floor space.

★ ★ ★

The installation of additional drawing equipment more than triples the capacity of the Listerhill plant to produce cold finished merchant products, while the new heat-treating furnace doubles the capacity to produce heat treated products. The net result was to



Overall view of new merchant making aluminum rod and bar products. In immediate foreground extreme right is reheating furnace. Chain conveyors discharge billets from furnace to roller conveyor feeding the breakdown mill. Material then passes on to looping mill stands extending across the floor in center portion of the mill area. * * * * * * * * * *

MUSIC WIRE and SPECIAL WIRES

Music Wire for Industrial Purposes
211 sizes Bright Polished, .0015" to .3125"
45 sizes Bright Tinned, .003" to .125"
Aluminum—Annealed—Belt Lacing—Brass, Soft and Spring—Copper, Bare and Tinned
Coppered Steel Spring—Galvanized—Tinned
Monel—Nickel Silver—Pure Soft Nickel—Oil Tempered, Steel Spring, Black Finish
Phosphor Bronze, Spring Temper—Pure Iron Wire—Resistance Wire,
Hoskins Chromel "A"—Stainless, Soft and Spring Temper—Tag Wire, 1000
in an Envelope—Florist Wire—Spooled and Coiled, ¼-½-1-5#
Wires Straightened and Cut to length—Small Gauges—Small orders our specialty
Wires and Strands for the fishermen. Trolling Wires, Copper-Monel-Stainless.
Leader Wires, "Wilstabrite" Stainless and "Silverbrite" Music.

THE MALIN & COMPANY

2514 Vestry Ave. Established in 1884 **Cleveland 13, Ohio**

REELS • SPOOLS

ALL SIZES

WOOD - PLYWOOD - WOOD - METAL

RETURNABLE NON-RETURNABLE

Samples and Prices on Request

DURKEE MFG. CO. **PINE RIVER, MINN.**

You Can Form Thousands of Bends and Shapes on Your Own Foot Press with

The **SMS** **FOOT PRESS COILER**

Fits any standard foot press • Choice of 4 gear ratios

Four Times Faster than Hand Operation

For all wire up to .125

Write for literature

THE SPRING MFRS. SUPPLY CO. 95 Marion Ave., Plantsville, Conn.

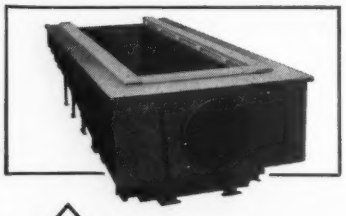
Long Life... free from Corrosion
HAVEG Pickling Tanks

There is no substitute for genuine Haveg tanks with their superior resistance to corrosion and permanent freedom from contamination.

HAVEG is a moldable, thermosetting plastic made of asbestos and resins selected for specific service with various corrosives. It is not a lining or coating . . . but is a solid corrosion-resistant material through and through.

As you increase the speed and output of pickling, the need for Haveg tanks, perforated pipe, pumps, pipe and valves increases. Act now.

Write for 64-page Bulletin F-6 with tank sizes, method of construction, chemical ratings.



HAVEG CORPORATION
NEWARK 47, DELAWARE

approximately double Reynolds capacity to produce merchant type products. And by relieving congestion in the structural mill, its capacity to produce large rod and structural shapes was also doubled.

* * *

In the new merchant mill, rod products will be produced up to 2.0-inches in diameter, while wire can be furnished down to approximately 0.092-inch in diameter in either coiled or in straightened lengths. A complete line of rectangles, squares, hexagons, angles, and flattened wire can also be produced in much greater quantities than ever before.

* * *

The great diversity of the size and types of products manufactured in the merchant mill eventually find their way into an even greater variety of end products. Some of the more common items which are made from Reynolds wire, rod and bar products are automobile pistons, carburetor and condenser parts, camera parts and accessories, cigarette lighters, outboard motor parts, household door hardware and locks, aircraft fittings, rocket parts, nuts, bolts, screws, rivets, nails and hundreds of others too numerous to mention.

Scholarships to Be Awarded By American Chemical Paint

It has been announced that the **American Chemical Paint Company** will present college scholarships of four years' duration to two Ambler Joint High School Graduates. One scholarship will be for study in the field of chemistry or chemical engineering; the other will be in agriculture.

* * *

Selection of recipients is to be made by a committee composed of members of the administrative staffs of the American Chemical Paint Company and the Ambler Joint High School; and the awards will be announced at the annual Commencement Exercises of the Ambler Joint High School.

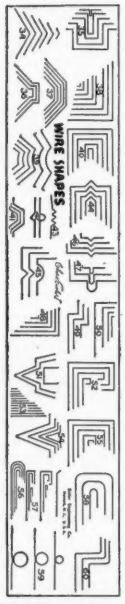
* * *

Creation of the American Chem-

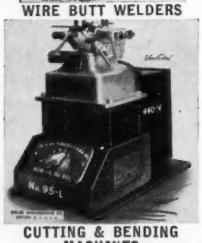
For FINE WIRES from .001" to 1/16"
High Speed Wire Cutters and Benders. Wire Spot Welders and Wire Butt Welders. Ask for test samples. Established 1920.

FINE WIRE SPOT WELDERS

Indexing Turntables
Cam Milling Service



WIRE BUTT WELDERS



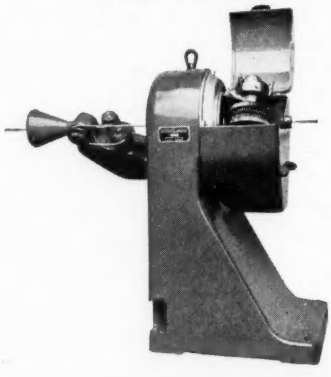
CUTTING & BENDING MACHINES

EISLER ENGINEERING CO., Inc.
747 So. 13th St., Newark 3, N. J., U. S. A.

Get **MORE** Wire Mileage with

HEANIUM®
Quality Guides
Highly resistant to wear.
Decreases down-time and replacement cost.
HEANY INDUSTRIAL CERAMIC CORP.
New Haven, Connecticut

LINÉ-GORCY
MECHANICAL
WIRE ROD DESCALERS
(Patented in U.S.A.)



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SOLE AMERICAN DISTRIBUTORS
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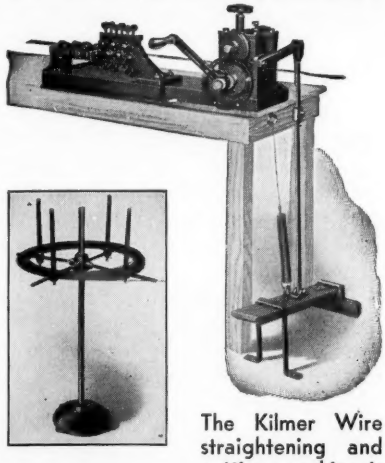
Telephone: OXford 7-3294

WIRE STRAIGHTENER



The Kilmer Wire straightening and cutting machine is hand operated and recommended for wire No. 8 to No. 19 gauge.
Wire Reel will handle coils up to 150 lbs. with I.D. adjustments from 7" to 22" and 30" O.D.

M. D. KILMER & COMPANY
4840 BROOKPARK RD.
CLEVELAND 9, OHIO

METAL BOUND RETURNABLE REELS

Made in 12" to 24" diameters.

No nails used. *All glued construction.* Made of kiln-dried wood. Special design prevents breaking or splintering of wood, protecting insulated wire from damage.

Write for details

WILLIAM McCASKIE, INC.
FORGE ROAD • WESTPORT • MASS.
Tel.: 145 Est. 1903

ical Paint Company Scholarships reflects the Company's continuing interest in technical education and its awareness of the importance of the two fields in which it has pioneered for forty years and to which it has made major contributions for many years—rust proofing, and agricultural chemistry.

New Movie Tells Story of Welded Wire Fabric Uses

The fabulous story of the bold men whose bold ideas led to the marvels of modern construction is told in "The Builders," a new full-color, sound motion picture shown for the first time in May by the **Wire Reinforcement Institute, Inc.** The picture, non-technical in nature, features a professional cast.

★ ★ ★

Entailing over 13,000 miles of travel in many states, the location footage of the new film portrays many new developments in the uses of welded wire fabric and points up the vital role played by this product in the reinforcement of today's construction, including highways, large buildings, residences, bridges, tunnels, canals, and concrete pipe.

★ ★ ★

The storyline for "The Builders" was created by the outstanding Cleveland radio, TV and motion picture writers, Frank Siedel and William D. Ellis. Industrial Motion Pictures, Inc., of Cleveland, produced the new film. The studio work was done at The Calvin Company sound stage in Kansas City, Mo.

★ ★ ★

The Wire Reinforcement Institute, a trade association with headquarters in the National Press Building, Washington 4, D. C., sponsors research activities and furnishes general and specific information on fabric and its uses to engineers, architects and builders. The Institute's membership represents the manufacturers and producers of over 95 percent of the welded wire fabric used in the United States and its possessions.

★ ★ ★

Distribution of the new half

FOR BETTER PRODUCTION

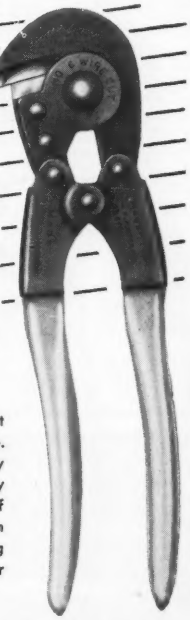
NATIONAL OFFERS YOU THREE SERVICES

- DIAMOND POWDER RECLAMATION — Exclusive process that gives maximum recovery. Send us your old cotton, die washings, worn wheels and sludge. High salvage percentages will pay you well.
- DIAMOND POWDERS—Complete line of graded quality powders for all lapping and finishing operations on wire drawing dies. First grades only.
- DIAMOND GRINDING WHEELS—A complete line of top-quality wheels for industrial production.

Write for prices.

NATIONAL RESEARCH COMPANY
25530 LITTLE MACK AVE.
ST. CLAIR SHORES, MICH.

HKP
PORTER HANDKLIP 6C WIRE CUTTER



For FREE CUTTING of wires, cable, rods, bolting wire and bolts up to medium hardness.

One of the handiest, most useful cutters ever made. Parrot-beak jaw quickly locates material for easy cutting. Protruding tip of jaw prevents wire from slipping, aids in stretching wire and is great for pulling out staples.

Essential equipment for cutting high tensile communication and power wires used in rural electrification (Model 6B with special hard cutting edges). See your supplier.

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ALUMINUM and COPPER
FINE WIRE
BARE AND TINNED CONCENTRIC STRAND
— AT ATTRACTIVE PRICES —
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For the finest quality, accurately graded diamond powders—specify "DANFORTH."
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We make no paste compounds, as we believe diamond powder is more economical to use.
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The DANFORTH PROCESS reclaims powders that will be 99%, or better pure—higher than Government specifications and with more powder reclaimed than by any other process—all accurately graded.
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Established in 1912
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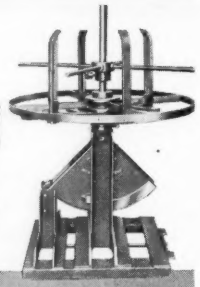
Safe!
Convenient!
Adjustable!

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WIRE REEL
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Counter balanced for simple one-man loading. Equipped with friction drag brake. Smooth running, vertical, horizontal or angle feed. Rugged construction—long service life. Quick adjustment to coil diameter. Safe, convenient, positive controls.
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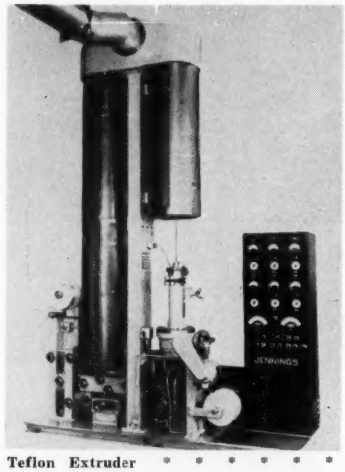
TUNGSTEN CARBIDE WIRE DRAWING DIES
DESIGNED FOR LONG LIFE AND MAXIMUM WIRE PRODUCTION
Furnished semi-finished to within .001" to .002" of finished size at rough-drilled die prices. Require only light sizing and polishing before using. Our dies embody special design features that make for superior performance.
Also, a full line of carbide tooling for the Cold Heading Industry
EASTERN CARBIDE CORPORATION
NEW ROCHELLE, N. Y.

hour film on a nationwide basis will be handled by Modern Talking Picture Service, Inc., New York, and will be without cost to the user, except transportation charges.

New Machine Puts "Teflon" on Wire

A new, compact, packaged machine for putting "Teflon" (DuPont's trade mark for its tetrafluoroethylene resin) on wire has recently been developed by **Jennings Engineering, Inc.,** 3457 Chestnut Street, Philadelphia 4, Pa. The unit, called the TE-1 "Teflon" Wire Insulating Extruder, requires only one operator, operates by push button control and occupies a space 9′ long by 3′ wide by 14′ high. It weighs 4000 lbs.



Teflon Extruder

The Jennings Extruder runs bare wire from a spool through an extruder unit assembly where paste "Telflon" is applied to the wire. A vaporizing oven then extracts the extrusion aid from the "Teflon" and the wire passes through sintering ovens where the resin is cooked to the wire. The coated wire is then rewound on a take up reel. Danger of the wire breaking during the wind up process is eliminated by a tensioning assembly that keeps the wire from becoming over taut. Coating density, wire speed and oven temperatures are all regulated at the control panel. Emergency stop buttons on the Extruder can be pushed to stop the process instantly if required.

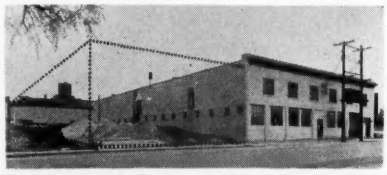
★ ★ ★

For complete details, write Jen-

nings Engineering Inc., 3457 Chestnut Street, Philadelphia 4, Pa.

Acrometal Expands to Meet Demand for Acropak Spools

Acrometal Products, Inc., of Minneapolis, makers of the well-known Acropak precision aluminum spools for processing and packaging magnet wire, broke ground in April for a new addition to their factory.



New Acrometal Factory Addition * * * *

The new wing will add 8,000 ft. of new production line space to the current factory and has been made necessary by the continually increasing demand for these special spools in the wire trade.

★ ★ ★

The building will incorporate the newest equipment for production efficiency and the addition will become an integral part of the original building. The ground-level floor, now increased to 23,000 square feet, will be completely redesigned for efficiency and straight-line production flow.

★ ★ ★

"This is our answer to anyone who asks what we think of the future of American business," said **Fred J. Bieber,** General Manager and Director of Acrometal Products and Director also of the parent company, U. S. Bobbin and Shuttle of Lawrence, Mass. "Our business has doubled in the last three years and with more wire producers calling for Acropaks every year, we intend to see that production and deliveries are maintained at the established high Acropak standard."

★ ★ ★

Acropak now ships spools to more than 70 wire producers in this country and to many points overseas. They produce both aluminum alloy and steel spools, but their avowed pet is a welded aluminum spool in which the head is

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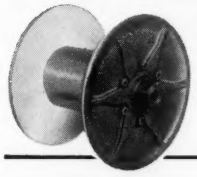
Save on replacement and maintenance!

RUGGED STEEL HEAVY DUTY PROCESSING REELS



Having trouble with light weight reels failing in heavy duty service? Send us a sketch or print stating the limiting dimensions and service required, we'll be glad to tell you about our facilities for supplying the wire rope and cable industry with special heavy duty processing reels, spools or bobbins. WRITE FOR BULLETIN 52-W.

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DESIGNERS – ENGINEERS – MANUFACTURERS
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Buy the Best: MONTGOMERY SILVER-COATED COPPER WIRE

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Quality in Diamonds + Perfection in Workmanship = Good Wire.

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These diamonds are drilled to precision tolerances, varying in proportion to the diameter, normally 0.3 to 3.5 microns. Closer tolerances can be supplied, if required.

Let us quote on your diamond die requirements.

North American Philips Company, Inc.
Elmet Division, Lewiston, Maine

Norelco

Note below the highly polished precision shaped drawing channel of this die for drawing copper which gives a burnished finish to the wire and long life to the die.

MASTER-MADE by **PHILIPS**

an integral part of the barrel, thus eliminating cracks to trap the wire and reducing weight by one-half.

★ ★ ★

The firm is located at 616 Fifth St. North, Minneapolis 1, Minn.

New Type Wire Straightening and Cut-Off Machine

A new type, high-speed rotary wire straightening and cut-off machine has been developed by the **G. C. Patterson Machine Company,** 3409 Trumbull Street, Cleveland 15, Ohio.

★ ★ ★

This low-cost machine has been specifically engineered to remove waves, bends and kinks from 1/16-inch to 1/4-inch-diameter wire and to cut lengths up to 40 inches at the rate of 125 feet per minute. Extensions can also be furnished to cut lengths up to 12 feet and longer.

★ ★ ★

Anti-friction ball and roller bearings are used throughout. All main bearings run in an enclosed oil bath to insure long, trouble-free service. The machine is designed so that all parts are easily accessible for quick, effective maintenance.

★ ★ ★

Variations of standard models are available to meet special requirements. For example, models are manufactured using variable speed drives, three hump cams for short lengths and high production, a horizontal and vertical roll straightener instead of rotary flyer or arbor, solenoid clutch operation, etc. In addition, models to handle ¼" to ½" and ½" to ⅝" wire are also available.

★ ★ ★

Details of this new line of machines may be obtained from the company at 3409 Trumbull Street, Cleveland 15, Ohio.

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Milled & Brazed Finished Recut
Many sizes carried in stock
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Outstanding in quality,
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EXPERT RECUTTING
DIAMOND DIES, DIAMOND POWDERS
Eastern Representative of
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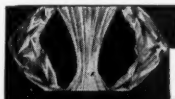
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FINE SIZE DIES
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DIES
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DIAMOND WIRE DRAWING DIES
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MOLINA
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DIES
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SPECIALISTS IN DIE REPAIR
WORK ON ALL TYPES OF DIES.
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CRanford 6-0116

New Bulletin on Carbide Rolls

The Metal Carbides Corporation, Youngstown, Ohio, announces the publication of a new Technical Bulletin, No. TB-3, entitled "Talide Rolling Mill Work Rolls." Included in the bulletin is a description of the difference between Grade A and Grade B rolls, as well as a list of types of strip steel that can be satisfactorily rolled with Grade B rolls and types of strip steel which require Grade A rolls to obtain the proper finish. Other information regarding reduction per pass, service life per grind, mechanical and production advantages, are also covered.

Add Wire Equipment

J. L. Greene, Greene Steel Co., Inc., Bush Terminal Bldgs., Nos. 85 and 86, Brooklyn 32, N. Y., has announced the installation of several Vaughn and Morgan Wire drawing machines and a number of Lewis straightening and cutting machines.

★ ★ ★

The company, who are steel distributors, will draw and process low and high carbon bright steel wire from $\frac{3}{8}$" to number 20 gauge.

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COIL LOADING and STRIPPING
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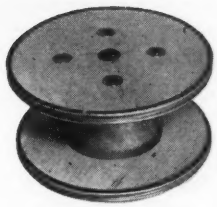
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HOWSAM SPOOL COMPANY
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Rust Preventatives
Lubricants
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BRAIDERS TAKE-UPS STRANDERS
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Talide Metal, the super hard tungsten carbide gives increased production, better finish, less down time and scrap on all wire mill operations.
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American Woodworking Company
1" to 60" Diameters. Send for our free catalogue of all wood products made in the U. S. A.
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PRODUCTIMETERS
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To prolong the wear and life of ROPE it pays to specify MADESCO BLOCKS
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ZINC WIRE
THE PLATT BROS. & CO.
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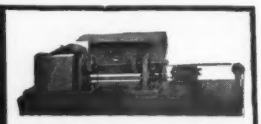
MODEL T-3 TORSION TESTER FOR WIRE

SCOTT TESTERS INC. 55 BLACKSTONE ST. PROVIDENCE 1, R.I.

They have a 4-car railroad siding and trailer loading facilities.

★ ★ ★

This location is a new one to which they moved on June 1st from 431 Broadway, Brooklyn. **William E. Leonard,** formerly Plant Superintendent at American Steel and Wire's Worcester Works, has been appointed Works Superintendent and Manager.

Reardon Joins Madison Wire

Charles E. Reardon has been appointed General Sales Manager of the Madison Wire Co., Inc., Buffalo, N. Y., manufacturers of high and low carbon wire. The appointment became effective as of June 1st. Mr. Reardon has moved from his home in Auburn, Mass. to Buffalo. He was formerly Sales Manager of the Johnson Steel and Wire Company and of the Wire Corporation, both of Worcester, Mass.

Carboloy Issues New Die Price List

The Carboloy Department of General Electric Company, Detroit 8, Mich., has issued a new specification and price list covering wire drawing dies, mandrels, shape dies, header die nibs, nail gripper nibs, bushings and guide rings. The new prices became effective on April 19th.

★ ★ ★

These are contained in their Catalog Supplement D-135, which will be sent to interested persons upon request.

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WILL INCREASE YOUR PRODUCTION
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Automatic Chain Making Machines
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The complete business is for sale at $100,000

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ENGLAND.

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Also, a lot of new 12 carrier parts.
Also, a lot of new D parts.
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FOR SALE: MORGAN CONTINUOUS WIRE DRAWING MACHINE, Type C, Serial 60, 5 Block, first class condition. Includes 20 H.P., 440 volt, 3 phase, 60 cycle, 1750 RPM motor and controller, with stripper basket and stand and a few extra parts. Price complete: $4,450.00 — a new machine of this type and capacity would cost about $19,000.00 today. Write to Box 759, Wire & Wire Products.

SUPERINTENDENT

Midwestern mill has opening for Superintendent with metallurgical and practical operation background. Experience on all finishes of wire required with emphasis on hot dip galvanizing. Please include complete resume of work experience. Write Box 700.

FINE WIRE FOREMAN

Fine opportunity to take full charge of low carbon fine wire drawing—annealing—tinning—galvanizing, old medium sized well established Midwestern Company.

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Specializing in Wire Mill Machinery, Plant Layout and Production Techniques.
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USED R-2 TUNGSTEN CARBIDE DIES
with more than 50% of die life remaining.

Forged casing size ¾" x 1¼" in the following diameters:

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Scott Testers, Inc. 802
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Sjogren Tool and Machine Co., Inc. 794
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Standard Electronics Research Corp. 727
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WHERE TO BUY

For more complete information, consult the annual Wire and Wire Products Buyers' Guide.
Only advertisers who have contracted for six or more insertions are listed in this section.

ABRASIVES—
Elgin National Watch Co., Abrasives Div., Elgin, Ill.
Hyprez Div., Engis Equipment Co., Chicago, Ill.
Norton Co., Worcester, Mass.

ACID INHIBITORS—
(See Inhibitors, Pickling)

ACID-PROOF CONSTRUCTION—
Ceilcote Company, Cleveland, Ohio
Chemical Construction Co., Pittsburgh, Pa.
Haveg Corporation, Newark, Del.
Heil Process Equipment Corp., Cleveland, Ohio

ALLOYS—Hardsurfacing Capstans, etc.
Parkway-Kew Corp., Menlo Park, N. J.

ANNEALING MACHINES — Electric Resistance
Syncro Machine Co., Perth Amboy, N. J.
Trauwood Engr. Co., Cleveland, O.

ANNEALING POTS AND BOXES—
Scudder, E. J. Fdry. & Mach. Co., Trenton, N. J.

BAKERS—
(See OVENS—Rod Bakers)

BOBBINS—Braider & Wire Weaving
Acrometal Products, Inc., Minneapolis, Minn.
Apco Mossberg Co., Attleboro, Mass.
Milton Machine Works, Inc., Milton, Pa.
Mossberg Pressed Steel Corp., Attleboro, Mass.
Standard Mill Supply Co., Pawtucket, R. I.
Wire & Textile Mach'y, Inc (used) Pawtucket. R. I.

BORAX—Wire Drawing
Pacific Coast Borax Co., New York, N. Y.

BORON CARBIDE—
Norton Co., Worcester, Mass.

CARRIERS—Braider, High Speed
Apco Mossberg Co., Attleboro, Mass.
Mossberg Pressed Steel Corp., Attleboro, Mass.
New England Butt Co., Providence, R. I.
Wire & Textile Mach'y, Inc. (used) Pawtucket. R. I.

CASTINGS—Wire Mill
Scudder, E. J. Fdry. & Mach. Co., Trenton, N. J.

CEMENTS—Acid Proof
Ceilcote Company, Cleveland, Ohio

CEMENTS—Refractory
Norton Co., Worcester, Mass.

CLEANERS—Metal
American Chemical Paint Co., Ambler, Pa.
Apex Alkali Products Co., Phila., Pa.
Metal & Thermit Corp., New York, N. Y.
Parkin Chemical Co., The, Pittsburgh, Pa.
Standard Industrial Compounds Co., Chicago.

CLEANING & PICKLING EQUIP.—
Ceilcote Company, Cleveland, Ohio
Chemsteel Construction Co., Pittsburgh, Pa.
Cleveland Tramrail Div., of the Cleveland Crane & Engineering Co., Wickliffe, O.
Haveg Corporation, Newark, Del.
Morgan Construction Co., Worcester, Mass.
Vaughn Machinery Co., Cuyahoga Falls, O.
Wean Equipment Corp., Cleveland, Ohio
Wilson, Lee, Engr. Co., Cleveland, Ohio
Youngstown Welding & Eng'g Co., Youngstown, Ohio.

CLOTH—WIRE, All Metals
Chase Brass & Copper Co., Waterbury, Conn.
Gantois, Saint Die (Vosges), France.
Wickwire Bros., Cortland, N. Y.

COATING COMPOUNDS—
Apex Alkali Products Co., Philadelphia, Pa.
Miller, R. H., Co., Inc., Homer, N. Y
Standard Industrial Compounds Co., Chicago

COMPOUNDS—Coppering
American Chemical Paint Co., Ambler, Pa.
Miller, R. H. Co., Inc., Homer, N. Y.

COMPOUNDS—Diamond (Pre-Mixed)
Eastern Carbide Corp., New Rochelle, N. Y.
Elgin National Watch Co., Abrasives Div., Elgin, Ill.
Hyprez Div., Engis Equipment Co., Chicago.
Superior Abrasive Labs., Yonkers, N. Y.
United States Industrial Diamond Corp., New York, N. Y.

COMPOUNDS—Extrusion, for Wire
(See COMPOUNDS—Vinyl)

COMPOUNDS—For Improving Drawing and Extrusion
American Chemical Paint Co., Ambler, Pa.

COMPOUNDS—Metal Finishing
American Chemical Paint Co., Ambler, Pa.
Apex Alkali Products Co., Philadelphia, Pa.
Metal & Thermit Corp., New York, N. Y.

COMPOUNDS—Phosphate Coating
American Chemical Paint Co., Ambler, Pa.

COMPOUNDS—Rust Preventing
American Chemical Paint Co., Ambler, Pa.
American Lanolin Corporation, Lawrence, Mass.
Apex Alkali Products Co., Philadelphia, Pa.

COMPOUNDS—Rust Removing
American Chemical Paint Co., Ambler, Pa.
Apex Alkali Products Co., Philadelphia, Pa.
Standard Industrial Compounds Co., Chicago.

COMPOUNDS—Vinyl, for Wire
Electronic Rubber Co., Stamford, Conn.

COMPOUNDS—Wire Drawing
Apex Alkali Products Co., Philadelphia, Pa.
Bick, Hans C., Inc., Reading, Pa.
Cook's Sons, Inc., Adam, Linden, N. J.
Miller, R. H. Co., Inc., Homer, N. Y.
Nopco Chemical Co., Harrison, N. J.
Pacific Coast Borax Co., New York, N. Y.
Standard Industrial Compounds Co., Chicago.
Swift & Company, Chicago, Ill.

CONDUCTORS—Flexible, Electrical
Montgomery Co., The, Windsor Locks, Conn.

COPHOLDERS—Steel
Apco Mossberg Co., Attleboro, Mass.
Mossberg Pressed Steel Corp., Attleboro, Mass.
Wire & Textile Mach'y, Inc. (used) Pawtucket. R. I.

CORDS—Electrical, Tinsel Conductor
Montgomery Co., The, Windsor Locks, Conn.

CRANES—Wire Mill
Cleveland Tramrail Div. of the Cleveland Crane & Engineering Co., Wickliffe, O.
Morgan Construction Co., Worcester, Mass.
Vaughn Machinery Co., Cuyahoga Falls, O.

CUTTING TOOLS—Carbide
Carboloy Dept. of General Electric Co., Detroit.
Eastern Carbide Corp., New Rochelle, N. Y.
Firth Sterling, Inc., Pittsburgh, Pa.
Metal Carbides Corporation, Youngstown, Ohio
Rusch Wire Die Corp., Croton-on-Hudson, N. Y.
Utica Drop Forge & Tool Corp., Utica, N. Y.
Vascoloy-Ramet Corp., Waukegan, Ill.
Willey's Carbide Tool Co., Detroit, Mich.

CUTTING TOOLS—Wire
Porter, H. K. Inc., Somerville, Mass.

DESCALING PROCESS—Sodium Hydride
du Pont de Nemours & Co., Inc., E. I., Wilmington, Del.

DIAMONDS—Industrial
Balloffet-Vianney Wire Die Co., Inc., Guttenberg, N. J.
Molina Industrial Diamond Co., New York, N. Y.
Rusch Wire Die Corp., Croton-on-Hudson, N. Y.
United States Industrial Diamond Corp., New York, N. Y.
Wayne Wire Die Co., Hillside, N. J.

DIAMOND POWDERS—
Danforth, The C. W. Co., Youngstown, Ohio
Elgin National Watch Co., Abrasives Div., Elgin, Ill.
Hyprez Div., Engis Equipment Co., Chicago, Ill.
Indiana Wire Die Co., Ft. Wayne, Ind.
Industrial Diamond Powders, Pittsburgh, Pa.
Molina Industrial Diamond Co., New York, N. Y.
National Research Company, St. Clair Shores, Mich.
New England Wire Die Co., Worcester, Mass.
Rusch Wire Die Corp., Croton-on-Hudson, N. Y.
United States Industrial Diamond Corp., New York, N. Y.
Universal Wire Die Co., Cranford, N. J.
Wayne Wire Die Co., Hillside, N. J.

DIAMOND POWDER RECLAIMING—
Danforth, The C. W. Co., Youngstown, Ohio
Industrial Diamond Powders, Pittsburgh, Pa.
Kay & Warren Co., Brooklyn, N. Y.
National Research Co., St. Clair Shores, Mich.
Molina Industrial Diamond Co., New York, N. Y.
Rusch Wire Die Corp., Croton-on-Hudson, N. Y.

DIAMOND TOOLS—
Indiana Wire Die Co., Ft. Wayne, Ind.
Metal Carbides Corporation, Youngstown, Ohio
Nord International Corp., Orange, N. J.
Universal Wire Die Co., Cranford, N. J.
Wayne Wire Die Co., Hillside, N. J.
Willey's Carbide Tool Co., Detroit, Mich.

DIES—Carbide, Tungsten & Tantalum
Balloffet-Vianney Wire Die Co., Inc., Guttenberg, N. J.
Boulin, Victor J., Inc., New York, N. Y.
Carboloy Dept. of General Electric Co., Detroit.
Eastern Carbide Corp., New Rochelle, N. Y.
Firth Sterling, Inc., Pittsburgh, Pa.
Indiana Wire Die Co., Fort Wayne, Ind.
Kelly Wire Die Corp., New York, N. Y.
Metal Carbides Corp., Youngstown, O.
Rusch Wire Die Corp., Croton-on-Hudson, N. Y.
Universal Wire Die Co., Cranford, N. J.
Vascoloy-Ramet Corp., Waukegan, Ill.
Wayne Wire Die Co., Hillside, N. J.
Willey's Carbide Tool Co., Detroit, Mich.

DIES—Cold Heading
Carboloy Dept. of General Electric Co., Detroit
Eastern Carbide Corp., New Rochelle, N. Y.
Firth Sterling, Inc., Pittsburgh, Pa.
Indiana Wire Die Co., Ft. Wayne, Ind.
Metal Carbides Corporation, Youngstown, Ohio
Vascoloy-Ramet Corp., Waukegan, Ill.
Willey's Carbide Tool Co., Detroit, Mich.

DIES—Diamond
Ajax Industrial Supplies, Inc., Fort Wayne, Ind.
Balloffet-Vianney Wire Die Co., Inc., Guttenberg, N. J.
Boulin, Victor J., Inc., New York, N. Y.
Cochaud Wire Die Inc., New York, N. Y.
Ft. Wayne Wire Die, Inc., Fort Wayne, Ind.
Indiana Wire Die Co., Ft. Wayne, Ind.
Kelly Wire Die Corp., New York, N. Y.
Molina Industrial Diamond Co., New York, N. Y.
New England Wire Die Co., Worcester, Mass.
North American Philips Co., Inc., Elmet Div., Lewiston, Me.
Rusch Wire Die Corp., Croton-on-Hudson, N. Y.
Universal Wire Die Co., Cranford, N. J.
Wayne Wire Die Co., Hillside, N. J.

DIES—Extrusion
Carboloy Dept. of General Electric Co., Detroit.
Eastern Carbide Corp., New Rochelle, N. Y.
Firth Sterling, Inc., Pittsburgh, Pa.
Metal Carbides Corporation, Youngstown, Ohio
Rusch Wire Die Corp., Croton-on-Hudson, N. Y.
Universal Wire Die Co., Cranford, N. J.
Wayne Wire Die Co., Hillside, N. J.
Willey's Carbide Tool Co., Detroit, Mich.

DIES—Eyelet
Eastern Carbide Corp., New Rochelle, N. Y.
Kelly Wire Die Corp., New York, N. Y.

DIES—Nail, Nail Cutters, Feeder Blocks, Grippers, etc.
Firth Sterling, Inc., Pittsburgh, Pa.
Pittsburgh Carbide Die Co., Monongahela, Pa.

DIES—Pointing
Sjogren Tool and Machine Co., Auburn, Mass.

DIES—Repairs & Re-Cutting
Ajax Industrial Supplies, Inc., Fort Wayne, Ind.
Balloffet-Vianney Wire Die Co., Inc., Guttenberg, N. J.
Boulin, Victor J., Inc, New York, N. Y.
Carboloy Dept. of General Electric Co., Detroit.
Cochaud Wire Die Inc., New York, N. Y.
Eastern Carbide Corp., New Rochelle, N. Y.
Firth Sterling, Inc., Pittsburgh, Pa.
Ft. Wayne Wire Die., Inc., Fort Wayne, Ind.
Indiana Wire Die Co., Ft. Wayne, Ind.
Kelly Wire Die Corp., New York, N. Y.
Metal Carbides Corporation, Youngstown, Ohio
New England Wire Die Co., Worcester, Mass.
North American Philips Co., Inc., Elmet Div., Lewiston, Me.
Rusch Wire Die Corp., Croton-on-Hudson, N. Y.
Universal Wire Die Co., Cranford, N. J.
Vascoloy-Ramet Corp., Waukegan, Ill.
Wayne Wire Die Co., Hillside, N. J.

DIES—Special Shapes, Etc.
Eastern Carbide Corp., New Rochelle, N. Y.
Firth Sterling, Inc., Pittsburgh, Pa.
Indiana Wire Die Co., Ft. Wayne, Ind.
Willey's Carbide Tool Co., Detroit, Mich.

DIES—Swaging
Sjogren Tool and Mach. Co., Inc., Auburn, Mass.

DIES—Tube Drawing
Balloffet-Vianney Wire Die Co., Inc., Guttenberg, N. J.
Carboloy Dept. of General Electric Co., Detroit.
Eastern Carbide Corp., New Rochelle, N. Y.
Firth Sterling, Inc., Pittsburgh, Pa.
Indiana Wire Die Co., Fort Wayne, Ind.
Kelly Wire Die Corp., New York, N. Y.
Metal Carbides Corp., Youngstown, O.
Rusch Wire Die Corp., Croton-on-Hudson, N. Y.
Vascoloy-Ramet Corp., Waukegan, Ill.
Willey's Carbide Tool Co., Detroit, Mich.

DRAW BENCHES—
(See MACHINERY—Draw Benches)

DRUMS & TRAVERSES—For Cable Reels
Hubbard Spool Co., Garrett, Ind.
New York Engineering Co., Yonkers, N. Y.
Republic Steel Corp., Pressed Steel Div., Niles, Ohio

DRYING EQUIPMENT
Carl-Mayer Corp., The, Cleveland, Ohio
Industrial Ovens, Inc., Cleveland, Ohio.
Michigan Oven Co., Detroit, Mich.
Rockwell, W. S. Co., Fairfield, Conn.

ENGINEERS—Consulting
Lubricants—Hans C. Bick, Inc., Reading, Pa.
Wire Mill—Clarence S. Arms, Worcester, Mass.
Zinc—Imhoff, Wallace G., Co., No. Highlands, Calif.

EYELETS—Brass or Zinc
Platt Bros. & Co., The, Waterbury, Conn.

FENCING & FENCES—Wire
Interlocking Fence Co., Morton, Ill.

FOAM PRODUCING COMPOUNDS—
American Chemical Paint Co., Ambler, Pa.
Parkin Chemical Co., The, Pittsburgh, Pa.

FURNACES—Brazing
Electric Furnace Co., Salem, Ohio
Harper Electric Furnace Corp., Buffalo, N. Y.
Lepel High Frequency Laboratories, Inc., New York, N. Y.
Rockwell, W. S. Co., Fairfield, Conn.

FURNACES—Galvanizing Equipment
Ajax Electric Co., Inc., Philadelphia, Pa.
Electric Furnace Co., Salem, Ohio
Rockwell, W. S. Co., Fairfield, Conn.
Surface Combustion Corp., Toledo, Ohio
Trauwood Engineering Co., The, Cleveland, Ohio
Wilson, Lee, Engr. Co., Cleveland, Ohio

FURNACES—Heat Treating
Ajax Electric Co., Inc., Philadelphia, Pa.
Carl Mayer Corp., The, Cleveland, Ohio
Electric Furnace Co., Salem, Ohio

WHERE TO BUY, Continued

For more complete information, consult the annual Wire and Wire Products Buyers' Guide.

York, N. Y.
Lepel High Frequency Laboratories, Inc., New
Rockwell, W. S., Co., Fairfield, Conn.
Spring Mfgrs. Supply Co., Plantsville, Conn.
Surface Combustion Corp., Toledo, Ohio
Trauwood Engr. Co., Cleveland, Ohio
Wilson, Lee, Engr. Co., Cleveland, Ohio

FURNACES—Induction
Lepel High Frequency Laboratories, Inc., New York, N. Y.

FURNACES—Lead Melting
Electric Furnace Co., Salem, Ohio
Rockwell, W. S. Co., Fairfield, Conn.
Surface Combustion Corp., Toledo, Ohio

FURNACES—Pot (oil, gas, electric)
Ajax Electric Co., Inc., Philadelphia, Pa.

FURNACES—Resistance Heating, Strand
(See Annealing Machines)

FURNACES—Salt Bath
Ajax Electric Co., Inc., Philadelphia, Pa.
Electric Furnace Co., Salem, Ohio
Rockwell, W. S. Co., Fairfield, Conn.
Surface Combustion Corp., Toledo, Ohio

GALVANIZING EQUIPMENT — (See MACHINERY—Galvanizing Wire)

GRINDERS—Roll
Norton Co., The, Worchester, Mass.

GUIDES—For Wire
Heany Industrial Ceramic Corp., New Haven, Conn.

GUIDE TIPS—For Extruding Machines (See NOZZLES)

HAMMERS—Nail Heading
Firth Sterling, Inc., Pittsburgh, Pa.
Pittsburgh Carbide Die Co., Monongahela, Pa.

HAMMERS—Swaging
Sjogren Tool and Machine Co., Auburn, Mass.

HARDSURFACING ALLOYS—
(See Alloys—Hardsurfacing)

HOOKS—Pickling & Liming
Youngstown Welding & Eng'g' Co., Youngstown, Ohio

HOISTS—Electric Travelling
Cleveland Tramrail Div. of the Cleveland Crane & Engineering Co., Wickliffe, Ohio

INHIBITORS—Pickling
American Chemical Paint Co., Ambler, Pa.
Apex Alkali Products Co., Philadelphia, Pa.
Parkin Chemical Co., The, Pittsburgh, Pa.

INSULATING MATERIALS—
Celanese Corporation of America, New York, N. Y.
Electronic Rubber Co., Stamford, Conn.
Glass Fibers, Inc., Toledo, Ohio
Heineman Corp., Oscar, Chicago, Ill.
Libbey-Owens, Ford Glass Co., Fiber Glass Div., Toledo, Ohio
Merrimac Paper Co., New York, N. Y.
New England Lacquer Co., E. Providence, R. I.

INSULATING MATERIALS — Paper—For Electric Wire Cable
Merrimac Paper Co., New York, N. Y.

LACQUERING SYSTEMS — See MACH.—Lacquering Electric Wire

LACQUERS—For Electric Wire
New England Lacquer Co., E. Providence, R. I.

LAME—LAHN—
Montgomery Co., The, Windsor Locks, Conn.

LIME—
Warner Co., The, Philadelphia and Bellefonte, Pa.

LUBRICANTS — For Metal Cutting, Stamping and Drawing
Apex Alkali Products Co., Philadelphia, Pa.
Celanese Corp. of America, New York, N. Y.
Miller, R. H., Co., Inc., Homer, N. Y.
Nopco Chemical Co., Harrison, N. J.
Standard Industrial Compounds Co., Chicago.

LUBRICANTS—Wire Drawing
(See Compounds—Wire Drawing)

LUBRICANTS—Wire Rope
Celanese Corp. of America, New York, N. Y.
Swift & Co., Chicago, Ill.

MACHINERY—Armoring (Cable, Wire, Hose)
American Insulating Mach'y Co., Phila., Pa.
Sleeper & Hartley, Inc., Worcester, Mass.
Watson Machine Co., Paterson, N. J.
Wire & Textile Mach'y, Inc., (used), Pawtucket, R. I.

MACHINERY—Barbed Wire
Glader Wm., Machine Works, Chicago, Ill.
Wafios, Maschinenfabrik, Reutlingen 3, Wurtt., Germany
Wean Engineering Co., Cleveland, Ohio

MACHINERY—Braiding
Fidelity Machine Co., Inc., Philadelphia, Pa.
New England Butt Co., Providence, R. I.
Wardwell Braiding Mach. Co., Central Falls, R. I.
Wire & Textile Mach'y, Inc. (used) Pawtucket, R. I.

MACHINERY—Bunching
Cook Manufacturing Co., The, Paterson, N. J.
Federal Manufacturing Co., Wallingford, Conn.
Haskell-Dawes Machine Co., Philadelphia, Pa.
New England Butt Co., Providence, R. I.
Niehaus, K. A., Maschinenfabrik, Dusseldorf-Rath, Germany
Sleeper & Hartley, Inc., Worcester, Mass.
Watson Machine Co., Paterson, N. J.
Wire & Textile Mach'y, Inc. (used) Pawtucket, R. I.

MACHINERY—Bundling, Scrap
Sleeper & Hartley, Inc., Worcester, Mass.
Vaughn Machinery Co., Cuyahoga Falls, O.

MACHINERY—Cable, Electric
American Insulating Mach'y Co., Phila., Pa.
Fidelity Machine Co., Inc., Philadelphia, Pa.
Haskell-Dawes Machine Co Philadelphia, Pa.
New England Butt Co., Providence, R. I.
New York Engineering Co., Yonkers, N. Y.
Niehaus, K. A., Maschinenfabrik, Dusseldorf-Rath, Germany
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Perth Amboy, N. J.
Watson Machine Co., Paterson, N. J.

MACHINERY—Capstans (See Machinery—Winding Wire)

MACHINERY—Centerless Grinding
Schumag Schumacher Metallwerke, Aachen, Germany.

MACHINERY—Chain Making
Cosa Corporation, New York, N. Y.
Nilson, A. H. Machine Co., Bridgeport, Conn.
Wafios, Maschinenfabrik, Reutlingen 3, Wurtt., Germany

MACHINERY—Closing Rope
Niehaus, K. A., Maschinenfabrik, Dusseldorf-Rath, Germany
Watson Machine Co., Paterson, N. J.

MACHINERY—Coiling Rod
Vaughn Mach'y Co., Cuyahoga Falls, O.
Waterbury-Farrel Fdry. & Mach. Co., Waterbury, Conn.

MACHINERY—Cold Heading
Waterbury-Farrel Fdry. & Mach. Co., Waterbury, Conn.

MACHINERY—Copper Wire Drawing
Aetna-Standard Engineering Co., Pittsburgh.
American Insulating Mach'y Co., Phila., Pa.
National Mach'y Exch. (Used), New York.
Syncro Machine Co., Perth Amboy, N. J.
Torrington Mfg. Co., Torrington, Conn.
Vaughn Machinery Co., Cuyahoga Falls, O.
Waterbury-Farrel Fdry. & Mach. Co., Waterbury, Conn.

MACHINERY—Covering Wire (See MACHINERY—Insulating Wire)

MACHINERY—Crimping Wire
Cedar West Tool Co., New York, N. Y.

MACHINERY—Cutting
Eisler Engineering Co., Newark, N. J.
Lewis Machine Co., The, Cleveland, Ohio
Mettler Machine Tool, Inc., New Haven, Conn.
Utica Drop Forge & Tool Corp., Utica, N. Y.
Wean Equipment Corp., Cleveland, Ohio
Wells, Frank L., Co., Kenosha, Wis.

MACHINERY—Descaling Rod, Dry
Fisher Associates, New York, N. Y.
Herborn, Herborn, Germany.

MACHINERY—Diameter Testing Continuous
Standard Electronic Research Corp., New York, N. Y.

MACHINERY—Die Making
Boulin, Victor J., Inc., New York, N. Y.
Carboloy Dept. General Electric Co., Detroit, Mich.
Dykrex Corp., Roos Tool & Mfg. Div., Newark, N. J.
Firth Sterling, Inc., Pittsburgh, Pa.
Kelly Wire Die Corp., New York, N. Y.
Nord International Corp., Orange, N. J.
Wayne Wire Die Co., Hillside, N. J.
Woodside Wire Corp., Wortendyke, N. J.

MACHINERY—Draw Benches
Morgan Construction Co., Worcester, Mass.
Torrington Mfg. Co., Torrington, Conn.
Vaughn Machinery Co., Cuyahoga Falls, O.

MACHINERY—Electrode Grinding
Cosa Corporation, New York, N. Y.

MACHINERY—Edging (See MACHINERY — Tandem Rolling and Edging Mills)

MACHINERY—Enameling
American Insulating Mach'y Co., Phila., Pa.
Cook Manufacturing Co., The, Paterson, N. J.
Industrial Ovens, Inc., Cleveland, Ohio
Michigan Oven Co., Detroit, Mich.
Rockwell Co., W. S., Fairfield, Conn.
Woodside Wire Corp., Wortendyke, N. J.

MACHINERY—Extruding
Aetna-Standard Engineering Co., Pittsburgh.
Davis-Standard Sales Corp., Mystic, Conn.
Royle, John, & Sons, Paterson, N. J.
Wire & Textile Mach'y, Inc. (used) Pawtucket, R. I.

MACHINERY—Fence
Glader, Wm., Machine Works, Chicago, Ill.
Interlocking Fence Co., Morton, Ill.
Wean Equipment Corp., Cleveland, Ohio

MACHINERY—Filament Coil Winding
Eisler Engineering Co., Newark, N. J.

MACHINERY—Flat Wire
Mettler Machine Tool, Inc., New Haven, Conn.
Torrington Mfg. Co., Torrington, Conn.
Wean Equipment Corp., Cleveland, Ohio

MACHINERY—Forming Wire
Baird Machine Co., Stratford, Conn.
Nilson, A. H., Machine Co., Bridgeport, Conn.
Wafios, Maschinenfabrik, Reutlingen 3, Wurtt., Germany

MACHINERY—Fourdrinier Looms
Cedar West Tool Co., New York, N. Y.

MACHINERY—Galvanizing Wire
Sleeper & Hartley, Inc., Worcester, Mass.
Steel Equipment Co., Cleveland, Ohio
Vaughn Machinery Co., Cuyahoga Falls, O.
Wean Equipment Corp., Cleveland, O.
Wilson, Lee, Engr. Co., Cleveland, Ohio

MACHINERY—Gang Winders
Entwistle, Jas. L. Co., Providence, R. I.
Syncro Machine Co., Perth Amboy, N. J.
Watson Machine Co., Paterson, N. J.
Woodside Wire Corp., Wortendyke, N. J.

MACHINERY—Grinding
Norton Co., The, Worcester, Mass.

MACHINERY—Insulating Wire
Aetna-Standard Engineering Co., Pittsburgh, Pa.
American Insulating Mach'y Co., Phila., Pa.
Davis-Standard Sales Corp., Mystic, Conn.
Ets. Pourtier Frères, Romainville, France
Fidelity Machine Co., Inc., Philadelphia, Pa.
New England Butt Co., Providence, R. I.
Royle, John & Sons, Paterson, N. J.
Syncro Machine Co., Perth Amboy, N. J.
Wardwell Braiding Mach. Co., Central Falls, R. I.
Watson Machine Co., Paterson, N. J.

MACHINERY—Knitting
Fidelity Machine Co., Inc., Philadelphia, Pa.

MACHINERY—Lacquering Electric Wire
American Insulating Mach'y Co., Philadelphia.
Cook Mfg. Co., The, Paterson, N. J.
Industrial Ovens, Inc., Cleveland, O.
Michigan Oven Co., Detroit, Mich.

MACHINERY—Lock Washer
Sleeper & Hartley, Inc., Worcester, Mass.

MACHINERY—Looms, Wire Weaving
Cedar West Tool Co., New York, N. Y.
Interlocking Fence Co., Morton, Ill.
Mummert-Dixon Co., Hanover, Pa.
Wafios, Maschinenfabrik, Reutlingen 3, Wurtt., Germany

MACHINERY—Material Handling
(See Material Handling Equipment)

MACHINERY—Measuring Wire & Cable
Davis Electric Co., Wallingford, Conn.
Durant Mfg. Co., Milwaukee, Wis.
New England Butt Co., Providence, R. I.
Standard Mill Supply Co., Pawtucket, R. I.
Watson Machine Co., Paterson, N. J.

MACHINERY—Nail and Tack
Baird Machine Co., The Stratford, Conn.
Glader, Wm., Machine Works, Chicago, Ill.
National Mach'y Exch. (Used), New York, N. Y.
Sleeper & Hartley, Inc., Worcester, Mass.
Wafios, Maschinenfabrik, Reutlingen 3, Wurtt., Germany

MACHINERY—Pickling
Chemsteel Construction Co., Pittsburgh, Pa.
Youngstown Welding & Eng'g Co., Youngstown, Ohio.

MACHINERY—Pin Making
Baird Machine Co., The, Stratford, Conn.
Cosa Corporation, New York, N. Y.

MACHINERY—Pointing
Aetna-Standard Engineering Co., Pittsburgh, Pa.
Morgan Construction Co., Worcester, Mass.
National Mach'y Exch. (Used), New York, N. Y.
Scudder, E. J., Fdry. & Mach. Co., Trenton, N. J.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Perth Amboy, N. J.
Vaughn Machinery Co., Cuyahoga Falls, O.
Waterbury-Farrel Foundry & Machine Co., Waterbury Conn.
Wean Equipment Corp., Cleveland, Ohio

MACHINERY—Poultry Wire Fencing
Interlocking Fence Co., Morton, Ill.
Wean Equipment Corp., Cleveland, O.

MACHINERY—Re-Spooling
Boyd & Sons Manufacturing Corp., Philadelphia, Pa.
Cedar West Tool Co., New York, N. Y.
Davis Electric Co., Wallingford, Conn.
Eisler Engineering Co., Newark, N. J.
Emory, Robert J., Co., Newark, N. J.
Mummert-Dixon Co., Hanover, Pa.
National Mach'y Exch. (Used), New York, N. Y.
Steel Equipment Co., Cleveland, Ohio
Vaughn Machinery Co., Cuyahoga Falls, O.
Watson Machine Co., Paterson, N. J.
Wean Equipment Corp., Cleveland, Ohio

WHERE TO BUY, Continued

For more complete information, consult the annual Wire and Wire Products Buyers' Guide.

Wire & Textile Mach'y, Inc. (used) Pawtucket, R. I.
Wire Insulating Machy., Div. of Machinery Electrification, Inc., Northboro, Mass.
Woodside Wire Corp., Wortendyke, N. J.

MACHINERY—Rod Mill
Morgan Construction Co., Worcester, Mass.
Schumag Schumacher Metallwerke, Aachen, Germany
Wean Equipment Corp., Cleveland, Ohio

MACHINERY—Rolling Mill
Morgan Construction Co., Worcester, Mass.
Torrington Mfg. Co., Torrington, Conn.
Waterbury-Farrel Foundry & Machine Co., Waterbury, Conn.

MACHINERY—Rubber Insulating
Davis-Standard Sales Corp., Mystic, Conn.
Royle, John & Sons, Paterson, N. J.
Wire & Textile Mach'y, Inc. (used) Pawtucket, R. I.

MACHINERY—Spark Testing
Davis Electric Co., Wallingford, Conn.
Federal Manufacturing Co., Wallingford, Conn.
Peschel Electronics, Inc., New Rochelle, N. Y.
Wire & Textile Mach'y, Inc. (used) Pawtucket, R. I.

MACHINERY—Spring Making
Carlson Company, The, New York, N. Y.
National Mach'y Exch. (Used), New York, N. Y.
Sleeper & Hartley, Inc., Worcester, Mass.
Torrington Mfg. Co., Torrington, Conn.
Wafios, Maschinenfabrik, Reutlingen 3, Wurtt., Germany
Wells, Frank L., Co., Kenosha, Wisc.

MACHINERY—Staple
Sleeper & Hartley, Inc., Worcester, Mass.
Wafios, Maschinenfabrik, Reutlingen 3, Wurtt, Germany.

MACHINERY—Straightening & Cutting
Cosa Corporation, New York, N. Y.
Kilmer, M. D., & Co., Cleveland, Ohio
Lewis Machine Co., The, Cleveland, Ohio
Medart Co., The, St. Louis, Mo.
Mettler Machine Tool Co., New Haven, Conn.
National Mach'y Exch. (Used), New York, N. Y.
Wells, Frank L., Co., Kenosha, Wisc.

MACHINERY—Stranding
Haskell-Dawes Machine Co., Philadelphia, Pa.
Maillefer S. A., Renens-Lausanne, Switzerland.
Milton Machine Works, Inc., Milton, Pa.
New England Butt Co., Providence, R. I.
Niehaus, K. A., Maschinenfabrik, Dusseldorf-Rath, Germany
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Perth Amboy, N. J.
Watson Machine Co., Paterson, N. J.

MACHINERY—Studmaking
Cosa Corporation, New York, N. Y.

MACHINERY—Swaging
Waterbury-Farrel Foundry & Machine Co., Waterbury, Conn.

MACHINERY—Take-Up and Pay-Out
Aetna-Standard Engineering Co., Pittsburgh, Pa.
American Insulating Mach'y Co., Phila., Pa.
Davis Electric Co., Wallingford, Conn.
Davis-Standard Sales Corp., Mystic, Conn.
Ets. Pourtier Frères, Romainville, France
Federal Manufacturing Co., Wallingford, Conn.
Industrial Ovens, Inc., Cleveland, Ohio
Michigan Oven Co., Detroit, Mich.
New York Engineering Co., Yonkers, N. Y.
Standard Mill Supply Co., Pawtucket, R. I.
Watson Machine Co., Paterson, N. J.
Wire Insulating Machy., Div. of Machinery Electrification, Inc., Northboro, Mass.
Woodside Wire Corp., Wortendyke, N. J.

MACHINERY—Taping
American Insulating Mach'y Co., Phila., Pa.
Ets. Pourtier Frères, Romainville, France
New England Butt Co., Providence, R. I.
Syncro Machine Co., Perth Amboy, N. J.
Watson Machine Co., Paterson, N. J.
Wire & Textile Mach'y, Inc. (used) Pawtucket, R. I.

MACHINERY—Testing Magnet Wire Coatings for Pin Holes
Peschel Electronics, Inc., New Rochelle, N. Y.

MACHINERY—Testing, Physical
Scott Testers, Inc., Providence, R. I.
Spring Mfgs. Supply Co., Plantsville, Conn.

MACHINERY—Tinning Wire
American Insulating Mach'y Co., Phila., Pa.
Cook Manufacturing Co., The, Paterson, N. J.
Michigan Oven Co., Detroit, Mich.
Steel Equipment Co., Cleveland, Ohio
Syncro Machine Co., Perth Amboy, N. J.
Wean Equipment Corp., Cleveland, Ohio.

MACHINERY—Tinsel Rolling Mills
American Insulating Mach'y Co., Phila., Pa.
Woodside Wire Corp., Wortendyke, N. J.

MACHINERY—Trolley Wire
Torrington Mfg. Co., Torrington, Conn.
Vaughn Machinery Co., Cuyahoga Falls, O.

MACHINERY—Tube Mill, Cold Drawing
Aetna-Standard Engineering Co., Pittsburgh, Pa.
Mettler Machine Tool, Inc., New Haven, Conn.

MACHINERY—Twinning
(See Mach.—Bunching)

MACHINERY—Twisters, Wire
Cook Manufacturing Co., The, Paterson, N. J.
Davis Electric Co., Wallingford, Conn.
Federal Manufacturing Co., Wallingford, Conn.
Haskell-Dawes Machine Co., Philadelphia, Pa.
Woodside Wire Corp., Wortendyke, N. J.

MACHINERY—Used
National Machinery Exchange, New York, N. Y.
Wire & Textile Machy., Inc., Pawtucket, R. I.

MACHINERY—for Wire Welding
(See WELDERS—Butt and Spot)

MACHINERY—Washer Forming
Cosa Corporation, New York, N. Y.

MACHINERY—Winding Wire
Cedar West Tool Co., New York, N. Y.
Eisler Engineering Co., Newark, N. J.
Emory, Robert J., Newark, N. J.
Federal Manufacturing Co., Wallingford, Conn.
Michigan Oven Co., Detroit, Mich.
Mummert-Dixon Co., Hanover, Pa.
New England Butt Co., Providence, R. I.
Standard Mill Supply Co., Pawtucket, R. I.
Watson Machine Co., Paterson, N. J.
Wire Insulating Machy., Div. of Machinery Electrification, Inc., Northboro, Mass.

MACHINERY—Wire Bending
Eisler Engineering Co., Newark, N. J.
Kilmer, M. D., & Co., Cleveland, Ohio

MACHINERY—Wire Drawing
Aetna-Standard Engineering Co., Pittsburgh, Pa.
Cook Manufacturing Co., The, Paterson, N. J.
Herborn, Herborn, Germany
Morgan Construction Co., Worcester, Mass.
National Mach'y Exch. (Used), New York, N. Y.
Schumag Schumacher Metallwerke, Aachen, Germany
Scudder, E. J., Fdry. & Mach. Co., Trenton, N. J.
Sleeper & Hartley, Inc., Worcester, Mass.
Steel Equipment Co., Cleveland, Ohio
Syncro Machine Co., Perth Amboy, N. J.
Vaughn Machinery Co., Cuyahoga Falls, Ohio
Waterbury-Farrel Foundry & Machine Co., Waterbury, Conn.
Wean Equipment Corp., Cleveland, Ohio.
Woodside Wire Corp., Wortendyke, N. J.

MACHINERY—Wire Forming
Baird Machine Co., The, Stratford, Conn.
Cosa Corporation, New York, N. Y.
Kilmer, M. D., & Co., Cleveland, Ohio
National Mach'y Exch. (Used), New York, N. Y.
Sleeper & Hartley, Inc., Worcester, Mass.

MACHINERY—Wire Rope
Milton Machine Works, Inc., Milton, Pa.
New England Butt Co., Providence, R. I.
Niehaus, K. A., Maschinenfabrik, Dusseldorf-Rath, Germany
Watson Machine Co., Paterson, N. J.

MACHINERY—Wrapping with Paper
Terkelsen Machine Co., Boston, Mass.

MATERIAL HANDLING EQUIPMENT—
Cleveland Tramrail Div. of The Cleveland Crane & Engineering Co., Wickliffe, O.

MILLS—Tandem, Rolling & Edging
Wean Equipment Co., Cleveland, Ohio

NAIL TOOLING—Tungsten Carbide
Firth Sterling, Inc., Pittsburgh, Pa.
Pittsburgh Carbide Die Co., Monongahela, Pa.

NAILS—Wire
Bethlehem Steel Co., Bethlehem, Pa.
Continental Steel Corp., Kokomo, Ind.
Keystone Steel & Wire Co., Peoria, Ill.
Sheffield Steel Corp., Kansas City, Mo.
Wickwire Brothers, Inc., Cortland, N. Y.

NOZZLES—For Extruding Machines
Wire Tool Div., Bridgeport Jig Boring Co., Bridgeport, Conn.

OVENS—Cable Lacquering
American Insulating Mach'y Co., Phila, Pa.
Carl-Mayer Corp., The, Cleveland, Ohio
Industrial Ovens, Inc., Cleveland, Ohio
Michigan Oven Co., Detroit, Mich.
Rockwell Co., W. S., Fairfield, Conn.

OVENS—Rod Bakers
Carl-Mayer Corp., The, Cleveland, Ohio

OVENS—Welding Rod Coating
Carl-Mayer Corp., The, Cleveland, Ohio
Industrial Ovens, Inc., Cleveland, Ohio
Michigan Oven Co., Detroit, Mich.

PAINT—Acid Proof
Ceilcote Company, Cleveland, Ohio

PAINT BONDING CHEMICALS—
American Chemical Paint Co., Ambler, Pa.

PAINTS—Heat Resisting
American Chemical Paint Co., Ambler, Pa.

PAPER—Creped Wrapping
National Waterproof Papers, Inc., Camden, N. J.
Terkelsen Machine Co., Boston, Mass.

PAPER—For Coil Wrapping and Corrosion Prevention
National Waterproof Papers, Inc., Camden, N. J.
Terkelsen Machine Co., Boston, Mass.

PATENT ATTORNEYS—
Lancaster, Allwine & Rommel, Washington, D. C.

PAY-OUT SYSTEMS—
(See MACHINERY—Take-Up & Pay-Out)

PHOSPHATE COATING CHEMICALS
(See COMPOUNDS—Phosphate Coating)

PICKLING COMPOUNDS—
See (Inhibitors—Pickling)

PICKLING—Hooks, etc. Acid Resisting
Youngstown Welding & Eng'g Co., Youngstown, Ohio

PICKLING TANK LININGS—
Chemsteel Construction Co., Pittsburgh, Pa.
Haveg Corp., Newark, Del.
Heil Process Equipment Corp., Cleveland, Ohio

PIPES & FITTINGS—Acid Resistant
Haveg Corp., Newark, Del.

PLASTICIZERS
Celanese Corp. of America, New York, N. Y.

PLASTICS—for Wire Insulation
Electronic Rubber Co., Stamford, Conn.

PLIERS—For Wire
Utica Drop Forge & Tool Corp., Utica, N. Y.

POTS—Lacquer
Industrial Ovens, Inc., Cleveland, Ohio

PRESSES—Hydraulic and Mechanical
Aetna-Standard Engineering Co., Pittsburgh, Pa.

PULLERS AND GRIPS—For Wire
Morgan Construction Co., Worcester, Mass.
Scudder, E. J. Fdry. & Mach. Co., Trenton, N. J.
Sjogren Tool and Machine Co., Auburn, Mass.
Sleeper & Hartley, Inc., Worcester, Mass.
Vaughn Machinery Co., Cuyahoga Falls, Ohio
Wean Equipment Corp., Cleveland, Ohio

REEL AND TENSION STANDS—
Davis Electric Co., Wallingford, Conn.
Fidelity Machine Company, Inc., Philadelphia
Industrial Ovens, Inc., Cleveland, Ohio.
Kilmer, M. D., & Co., Cleveland, Ohio
Moslo Machinery Co., Cleveland, Ohio
New York Engineering Co., Yonkers, N. Y.
Roll-A-Reel, Cincinnati, Ohio
Sleeper & Hartley, Inc., Worcester, Mass.
Standard Mill Supply Co., Pawtucket, R. I.
Syncro Machine Co., Perth Amboy, N. J.
Watson Machine Co., Paterson, N. J.
Wire Insulating Machy., Div. of Machinery Electrification, Inc., Northboro, Mass.

REEL CRUTCHES—
Roll-A-Reel, Cincinnati, Ohio
Watson Machine Co., Paterson, N. J.

REELS & SPOOLS—Aluminum Alloy
Acrometal Products, Inc., Minneapolis, Minn.
Hubbard Spool Co., Garrett, Ind.
Milton Machine Works, Inc., Milton, Pa.

REELS & SPOOLS—Annealing and Stranding
Acrometal Products, Inc., Minneapolis, Minn.
Apco Mossberg Co., Attleboro, Mass.
Howsam Spool Co., Aurora, Ill.
Hubbard Spool Co., Garrett, Ind.
Milton Machine Works, Inc., Milton, Pa.
Mossberg Pressed Steel Corp., Attleboro, Mass.
Republic Steel Corp., Pressed Steel Div., Niles, Ohio

REELS—Metal Bound
Durkee Mfg. Co., Pine River, Minn.
Howsam Spool Co., Aurora, Ill.
Hubbard Spool Co., Garrett, Ind.
McCaskie, Inc., Wm., Westport, Mass.

REELS—Plywood
Hubbard Spool Co., Garrett, Ind.
McCaskie, Inc., Wm., Westport, Mass.
Nelson Company, The, Baltimore, Md.

REELS & SPOOLS—Steel (All Types)
Acrometal Products, Inc., Minneapolis, Minn.
Apco Mossberg Co., Attleboro, Mass.
Clark, J. L. Mfg. Co., Rockford, Ill.
Howsam Spool Co., Aurora, Ill.
Hubbard Spool Co., Garrett, Ind.
Mason Can Company, East Providence, R. I.
Milton Machine Works, Inc., Milton, Pa.
Mossberg Pressed Steel Corp., Attleboro, Mass.
New York Engineering Co., Yonkers, N. Y.
Republic Steel Corp., Pressed Steel Div., Niles, Ohio

REELS—Wire Mill
Acrometal Products, Inc., Minneapolis, Minn.
Apco Mossberg Co., Attleboro, Mass.
Bridge Mfg. Co., The, Hazardville, Conn.
Durkee Mfg. Co., Pine River, Minn.
Howsam Spool Co., Aurora, Ill.
Hubbard Spool Co., Garrett, Ind.
Mason Can Company, East Providence, R. I.
McCaskie, Inc., Wm., Westport, Mass.
Mettler Machine Tool, Inc., New Haven, Conn.
Milton Machine Works, Inc., Milton, Pa.
Moslo Machinery Co., Cleveland, Ohio
Mossberg Pressed Steel Corp., Attleboro, Mass.

WHERE TO BUY, Continued

For more complete information, consult the annual Wire and Wire Products Buyers' Guide.

New York Engineering Co., Yonkers, N. Y.
Republic Steel Corp., Pressed Steel Div., Niles, Ohio

REELS & SPOOLS—Wooden
American Woodworking Co., Chicago, Ill.
Bridge Mfg. Co., Inc., The, Hazardville, Conn.
Durkee Mfg. Co., Pine River, Minn.
Hubbard Spool Co., Garrett, Ind.
Nelson Company, The, Baltimore, Md.

REFRACTORIES—High Temperature
Norton Company, Worcester, Mass.

ROD BAKERS—
(See OVENS—Rod Bakers)

RODS—Stainless Steel
American Steel & Wire Co., Cleveland, Ohio
Crucible Steel Co. of America, Pittsburgh, Pa.
Pittsburgh Steel Co., Pittsburgh, Pa.

RODS—Steel
Crucible Steel Co. of America, Pittsburgh, Pa.

RODS—Wire—Non-Ferrous
Chase Brass & Copper Co., Waterbury, Conn.
Kaiser Aluminum & Chemical Corp., Oakland, Calif.
Platt Bros. & Co., The, Waterbury, Conn.
Scovill Mfg. Co., Waterbury, Conn.

RODS—Wire, Steel
Bethlehem Steel Co., Bethlehem, Pa.
Colorado Fuel and Iron Corporation, Pacific Coast Division, Oakland, Calif.
Continental Steel Corp., Kokomo, Ind.
Crucible Steel Co. of America, Pittsburgh, Pa.
Keystone Steel & Wire Co., Peoria, Ill.
Pittsburgh Steel Co., Pittsburgh, Pa.
Sheffield Steel Corp., Kansas City, Mo.
Youngstown Sheet & Tube Co., Youngstown, O.

ROPE—Blocks
Madesco Tackle Block Co., Easton, Pa.

ROPE—Wire
American Steel & Wire Company, Cleveland, O.
Bethlehem Steel Co., Bethlehem, Pa.
Roebling's, John A. Sons Corp., Trenton, N. J.

RUST PROOF COMPOUNDS—
(See COMPOUNDS—Rust Preventing)

RUST REMOVING COMPOUNDS—
(See COMPOUNDS—Rust Preventing)

SATURATION SYSTEMS—
Industrial Ovens, Inc., Cleveland, Ohio
New York Engineering Co., Yonkers, N. Y.
Watson Machine Co., Paterson, N. J.
Wire & Textile Mach'y, Inc. (used) Pawtucket, R. I.

SOAPS—Industrial and Wire Drawing
(See COMPOUNDS—Wire Drawing)

SODIUM—for Descaling
du Pont de Nemours & Co., Inc., E. I., Wilmington, Del.

SPOOLS—(See Reels & Spools)

SPOOLS—Stamped Metal for Retail Wire Sales
Clark, J. L. Mfg. Co., Rockford, Ill.
Mason Can Co., East Providence, R. I.

STAMPINGS—Steel
Acrometal Products, Inc., Minneapolis, Minn.
Mossberg Pressed Steel Corp., Attleboro, Mass.

STRIP—Steel
Bethlehem Steel Co., Bethlehem, Pa.
Continental Steel Corp., Kokomo, Ind.
Roebling's, John A. Sons Corp., Trenton, N. J.
Youngstown Sheet & Tube Co., Youngstown, O.

STRIPPERS—Wire, Electric
Utica Drop Forge & Tool Corp., Utica, N. Y.

TANKS—Compound
New York Engineering Co., Yonkers, N. Y.
Watson Machine Co., Paterson, N. J.

TANKS—Pickling and Plating
Ceilcote Company, Cleveland, Ohio
Chemsteel Construction Co., Pittsburgh, Pa.

TESTERS — INSULATION
(See MACHINERY—Spark Testers)

TESTING EQUIPMENT
(See MACHINERY Testing, Physical and Diameter Testing)

TESTING EQUIPMENT—Springs
Spring Mfgs. Supply Co., Plantsville, Conn.

TINNING PROCESS—
Metal & Thermit Corp., New York, N. Y.

TINSEL—Electric Conductor
Montgomery Co., The, Windsor Locks, Conn.

TINSEL WIRE—Resistance, Lame, Decorative Cords Thread—Bare Copper, Silver and False Gold Coated, etc.
(See TINSEL—Electric Conductor)

TOOLS—Nail Machine
Pittsburgh Carbide Die Co., Monongahela, Pa.

TOOLS—Spring Forming
Spring Mfgs. Supply Co., Plantsville, Conn.

TOOLS—Welding Wire, Strip & Foil (Pressure)
Utica Drop Forge & Tool Corp., Utica, N. Y.

TOOLS—Wire Cutting
Porter, H. K. Inc., Somerville, Mass.
Utica Drop Forge & Tool Corp., Utica, N. Y.

TRAMRAIL SYSTEMS—
Cleveland Tramrail Div. of the Cleveland Crane & Engineering Co., Wickliffe, O.

TRANSMISSIONS—Variable speed (See Machy—Power Transmission)

TRAVERSES & DRUMS—For Reels
Drums & Traverses (See Drums & Traverses)

TRAVERSE MECHANISMS—
Apco Mossberg Co., Attleboro, Mass.
New England Butt Co., Providence, R. I.
Watson Machine Co., Paterson, N. J.
Wire & Textile Mach'y, Inc. (used) Pawtucket, R. I.
Wire Insulating Machy., Div. of Machinery Electrification, Inc., Northboro, Mass.

TUBE BENDERS AND FORMERS—
Kilmer, M. D., & Co., Cleveland, Ohio

VALVES & FITTINGS—Acid Resistant
Haveg Corp., Newark, Del.

VARNISHES—for Electric Wire
N. E. Lacquer Co., E. Providence, R. I.

VULCANIZING PANS AND EQUIPMENT—
American Insulating Mach'y Co., Phila., Pa.
Mossberg Pressed Steel Corp., Attleboro, Mass.
Wire Insulating Machy., Div. of Machinery Electrification, Inc., Northboro, Mass.

WELDERS—Spot and Butt
Eisler Engineering Co., Newark, N. J.
Hoffman Co., Robt. W., Chicago, Ill.
Micro Products Co., Chicago, Ill.
Utica Drop Forge & Tool Corp., Utica, N. Y.

WIRE—Aluminum
Elmet Division, North American Philips Company, Inc., Lewiston, Maine
Kaiser Aluminum & Chemical Corp., Oakland, Calif.
Malin & Co., The, Cleveland, Ohio
Scovill Mfg. Co., Waterbury, Conn.
Seneca Wire & Manufacturing Co., Fostoria, O.

WIRE—Barbed
Interlocking Fence Co., Morton, Ill.

WIRE—Brass
Chase Brass & Copper Co., Waterbury, Conn.
Scovill Mfg. Co., Waterbury, Conn.
Spencer Wire Corp., Union, N. J.

WIRE—Brush
Spencer Wire Corp., Union, N. J.

WIRE—Bunched & Stranded, Copper
Camden Wire Co., Camden, N. Y.

WIRE—Cast
Youngstown Sheet & Tube Co., Youngstown, O.

WIRE—Cold Heading
American Steel & Wire Co., Cleveland, Ohio
Bethlehem Steel Co., Bethlehem, Pa.
Camden Wire Co., Camden, N. Y.
Chase Brass & Copper Co., Waterbury, Conn.
Colorado Fuel and Iron Corporation, Pacific Coast Division, Oakland, Calif.
Continental Steel Corp., Kokomo, Ind
Crucible Steel Co. of America, Pittsburgh, Pa.
Kaiser Aluminum & Chemical Corp., Oakland, Calif.
Keystone Steel & Wire Co., Peoria, Ill.
Pittsburgh Steel Co., Pittsburgh, Pa.
Scovill Mfg. Co., Waterbury, Conn.
Seneca Wire & Manufacturing Co., Fostoria, O.
Sheffield Steel Corp., Kansas City, Mo.
Wickwire Steel Div., The Colorado Fuel & Iron Corp., New York, N. Y.
Youngstown Sheet & Tube Co., Youngstown, O.

WIRE—Copper
Chase Brass & Copper Co., Waterbury, Conn.
Spencer Wire Corp., Union, N. J.

WIRE—For Electrical Conductors
Camden Wire Co., Camden, N. Y.
Kaiser Aluminum & Chemical Corp., Oakland, Calif.

WIRE—Flat, Fine
Elmet Division, North American Philips Company, Inc., Lewiston, Maine
Montgomery Co., The, Windsor Locks, Conn.

WIRE—Galvanized
Colorado Fuel and Iron Corporation, Pacific Coast Division, Oakland, Calif.
Roebling's, John A. Sons Corp., Trenton, N. J.
Sheffield Steel Corp., Kansas City, Mo.
Wickwire Steel Div., Colorado Fuel & Iron Corp., New York, N. Y.

WIRE—Manufacturers
American Steel & Wire Co., Cleveland, Ohio
Bethlehem Steel Co., Bethlehem, Pa.
Chase Brass & Copper Co., Waterbury, Conn.
Colorado Fuel and Iron Corporation, Pacific Coast Division, Oakland, Calif.
Continental Steel Corp., Kokomo, Ind.
Crucible Steel Co. of America, Pittsburgh, Pa.
Johnson Steel & Wire Co., Worcester, Mass.
Kaiser Aluminum & Chemical Corp., Oakland, Calif.
Keystone Steel & Wire Co., Peoria, Ill.
National Lock Washer Company, The, Newark, N. J.
North American Philips Co., Inc., Elmet Division, Lewiston, Me.
Pittsburgh Steel Co., Pittsburgh, Pa.
Roebling's, John A., Sons Corp., Trenton, N. J.
Scovill Mfg. Co., Waterbury, Conn.
Seneca Wire & Manufacturing Co., Fostoria, O.
Sheffield Steel Corp., Kansas City, Mo.
Spencer Wire Corp., Union, N. J.
U. S. Steel Co., N. Y., N. Y.
Wickwire Brothers, Inc., Cortland, N. Y.
Wickwire Steel Div., Colorado Fuel & Iron Corp., New York, N. Y.
Youngstown Sheet & Tube Co., Youngstown, O.

WIRE—Music
American Steel & Wire Co., Cleveland, Ohio
Johnson Steel & Wire Co., Inc., Worcester, Mass.
Malin & Co., The, Cleveland, Ohio
Seneca Wire & Manufacturing Co., Fostoria, O.
Spencer Wire Corp., Union, N. J.

WIRE—Nickel Silver and Phosphor Bronze
Chase Brass & Copper Co., Waterbury, Conn.
Malin & Co., The, Cleveland, Ohio

WIRE—Oil Tempered
Crucible Steel Co. of America, Pittsburgh, Pa.
Pittsburgh Steel Co., Pittsburgh, Pa.
Roebling's, John A., Sons Corp., Trenton, N. J.
Sheffield Steel Corp., Kansas City, Mo.

WIRE—Silver Plated Copper
Camden Wire Co., Camden, N. Y.

WIRE—Special Shapes
Crucible Steel Co. of America, Pittsburgh, Pa.
Continental Steel Corp., Kokomo, Ind.
National Lock Washer Company, The, Newark, N. J.

WIRE—Spring
Bethlehem Steel Co., Bethlehem, Pa.
Colorado Fuel and Iron Corporation, Pacific Coast Division, Oakland, Calif.
Continental Steel Corp., Kokomo, Ind.
Crucible Steel Co. of America, Pittsburgh, Pa.
Johnson Steel & Wire Co., Inc., Worcester.
Keystone Steel & Wire Co., Peoria, Ill.
Pittsburgh Steel Co., Pittsburgh, Pa.
Roebling's, John A., Sons Corp., Trenton, N. J.
Seneca Wire & Mfg. Co., Fostoria, Ohio
Sheffield Steel Corp., Kansas City, Mo.
Wickwire Steel Div., Colorado Fuel & Iron Corp., New York, N. Y.
Youngstown Sheet & Tube Co., Youngstown, O.

WIRE—Stainless Steel
American Steel & Wire Co., Cleveland, Ohio
Crucible Steel Co. of America, Pittsburgh, Pa.
Firth Sterling, Inc., Pittsburgh, Pa.
National Lock Washer Company, The, Newark, N. J.
Pittsburgh Steel Co., Pittsburgh, Pa.

WIRE—Steel—Also Coppered and Galvanized Steel
Bethlehem Steel Co., Bethlehem, Pa.
Continental Steel Corp., Kokomo, Ind.
Colorado Fuel and Iron Corporation, Pacific Coast Division, Oakland, Calif.
Crucible Steel Co. of America, Pittsburgh, Pa.
Johnson Steel & Wire Co., Inc., Worcester, Mass.
Keystone Steel & Wire Co., Peoria, Ill.
Pittsburgh Steel Co., Pittsburgh, Pa.
Roebling's, John A., Sons Corp., Trenton, N. J.
Seneca Wire & Mfg. Co., Fostoria, Ohio
Sheffield Steel Corp., Kansas City, Mo.
Spencer Wire Corp., Union, N. J.
U. S. Steel Export Co., New York, N. Y.
Wickwire Brothers, Inc., Cortland, N. Y.
Wickwire Steel Div., Colorado Fuel & Iron Corp., New York, N. Y.
Youngstown Sheet & Tube Co., Youngstown, O

WIRE—Straightening and Cutting
Colorado Fuel and Iron Corporation, Pacific Coast Division, Oakland, Calif.
Wickwire Brothers, Inc., Cortland, N. Y.
Wickwire Steel Div., Colorado Fuel & Iron Corp., New York, N. Y.

WIRE—Tinned Copper
Camden Wire Co., Camden, N. Y.

WIRE—Tungsten
North American Philips Co., Inc., Elmet Division, Lewiston, Me.

WIRE—Zinc
Platt Bros. & Co., The, Waterbury, Conn.

WRAPPING PAPER—Creped
(See PAPER—Creped Wrapping)

YARNS & TAPES—Insulating
Celanese Corporation of America, New York, N. Y.
Glass Fibers, Inc., Toledo, Ohio
Heineman Corp., Oscar, Chicago, Ill.
Libbey-Owens-Ford Glass Co., Fiber Glass Div., Toledo, Ohio.

YARN TESTERS—
Scott Testers, Inc., Providence, R. I.

The WATSON MACHINE COMPANY

ESTABLISHED 1845

PATERSON 3, NEW JERSEY, U. S. A.

ELECTRICAL WIRE AND CABLE, WIRE ROPE, CORDAGE AND MASTICATING MACHINERY MANUFACTURERS

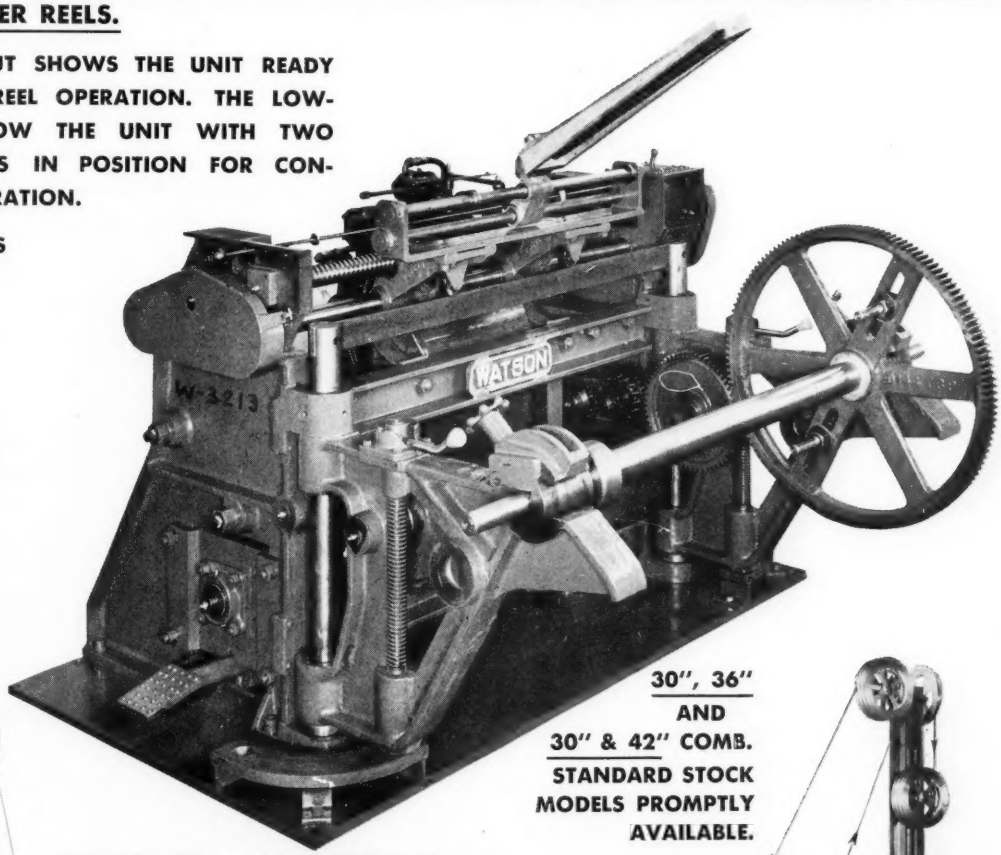
WATSON

TAKEUPS TYPE "DC"

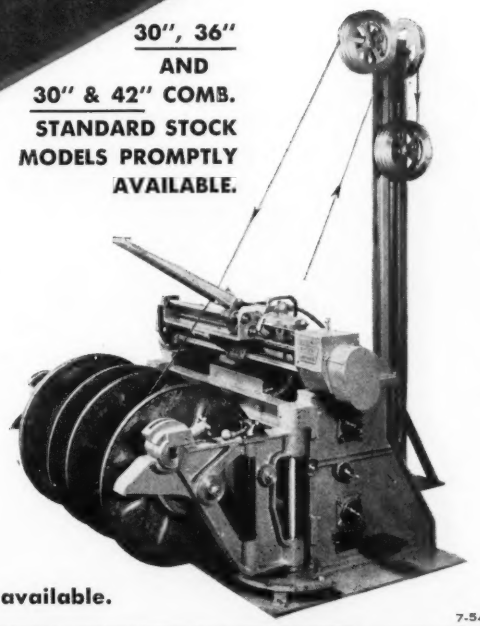
THIS DOUBLE PURPOSE "COMBINATION" MODEL OPERATES WITH SINGLE LARGE REELS AND QUICKLY CONVERTS TO A CONTINUOUS TAKEUP OPERATING WITH TWO SMALLER REELS.

THE UPPER CUT SHOWS THE UNIT READY FOR SINGLE REEL OPERATION. THE LOWER CUTS SHOW THE UNIT WITH TWO SMALLER REELS IN POSITION FOR CONTINUOUS OPERATION.

IN BOTH CASES THE TAKEUP FUNCTIONS WITHOUT FRICTION-SLIP, AND THE WINDING TENSION REMAINS UNIFORM DURING THE REEL-RUN BUILD-UP.



30", 36" AND 30" & 42" COMB. STANDARD STOCK MODELS PROMPTLY AVAILABLE.

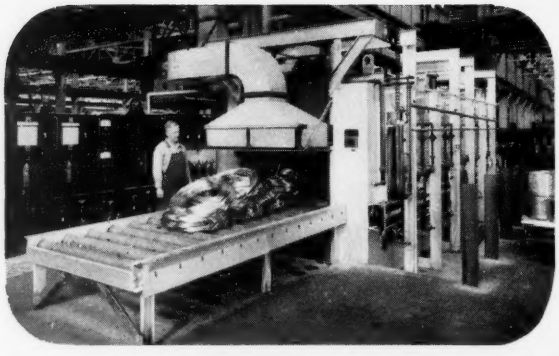


ANY OF OUR "DC" TAKEUPS IN THE FIELD CAN EASILY BE CONVERTED TO "COMBINATION" MODELS BY SUPPLY OF ADDITIONAL PARTS, WITHOUT DISTURBING THE TAKEUP LOCATION.

Machine bulletin 010553 available.

7-54

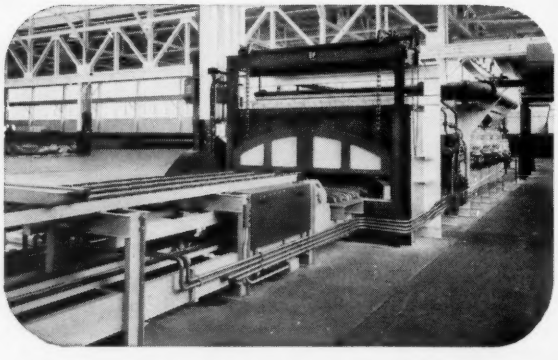
These combination electric and gas fired radiant tube bulkhead tray type furnaces are used extensively for bright annealing wire on reels and in coils.



An EF gas fired three-chamber roller hearth with forced circulating system providing accurate temperature distribution, uniform finish and anneal — continuously.

INVESTIGATE EF DEVELOPMENTS

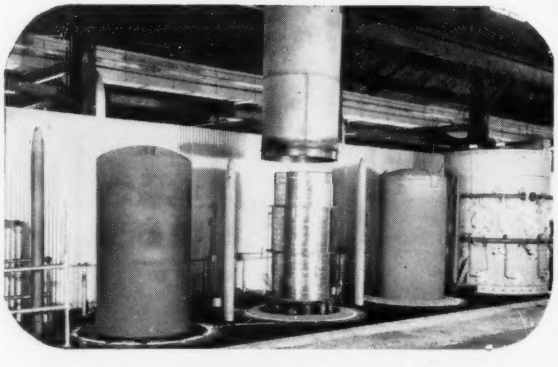
Clean annealing nickel-silver and other alloy wire in an EF gas fired radiant tube continuous roller hearth furnace. Handles coils up to 30" in diameter.



Wire bars up to 66" in length are uniformly and scale-free heated for rolling in this EF gas fired continuous pusher type furnace. Capacity 12,000 lbs. per hour.

FOR EVERY Annealing, Heating or Heat Treating PROCESS

• We have made outstanding production installations for normalizing rod and bright annealing wire in coil, strands, on reels and spools; both ferrous and non-ferrous, including stainless—for heat treating bolts, springs and other wire products—for heating billets, wire bars, bluing nails and other heating and heat treating processes. We solicit your furnace inquiries.



EF gas fired and electric hood, pit and other batch and continuous type furnaces are available for normalizing rod, annealing wire, strip and other processes.

THE ELECTRIC FURNACE CO.

GAS FIRED, OIL FIRED AND ELECTRIC FURNACES FOR ANY PROCESS, PRODUCT OR PRODUCTION

Salem - Ohio

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